RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

PUBLISHED EVERY FRIDAY BY THE RAILROAD GAZETTE AT 83 FULTON STREET, NEW YORK

BRANCH OFFICES AT 375 OLD COLONY BUILDING CHICAGO, AND QUEEN ANNE'S CHAMBERS WESTMINSTER, LONDON

EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

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VOL. XLIV., No. 8. FRIDAY, FEBRUARY 21, 1908.

Colonel Prout, editor of the *Railroad Gazette* from 1887 until 1903, contributes this week a letter on the Soudan Railroad from the Red Sea to the Nile, which brings vividly to remembrance a piece of uncommonly interesting history, in the making of which he had an important part. We printed in the issue of February 14 an account of the operation of the railroad which has been built just about where Colonel Prout made surveys, more than 30 years before. If this line had been built at the time when he recommended it the political and economic history of the Soudan would have been changed radically. Colonel Prout is quite wrong in supposing that there is anyone on the editorial staff of the *Railroad Gazette* to-day who is ignorant of his work, first as Major and then as Colonel in the army of the Khedive, and as Governor-General of the Provinces of the Equator, succeeding General Gordon while Gordon was in command at Khartoum. If those who served with him on the *Railroad Gazette* fail to grasp all the detail of his remarkable work in the East, it is because the Colonel combined performance with silence, to a degree unknown in most offices, and conspicuously absent in the government of this country. It is very much to the Colonel's credit that those who worked with him and knew him best have learned most of what they know about his record in the Nile country from outside sources.

It is announced that the Interstate Commerce Commission on February 27 will take testimony as to the need of action by the commission postponing the day on which railroads shall comply with the law limiting the working hours of telegraphers and signalmen. This law goes in effect March 4, unless the commission shall issue an order modifying it. The proviso giving power to the commission in this respect applies only to these classes of employees (not to trainmen) and the commission has issued a notice holding that the proviso is extremely limited. It is believed to apply only in exceptional instances of unusual conditions which could not have been foreseen. Conditions common to many railroads cannot be deemed "a particular case" for relief by the commission. The fact that business is small at a given station can have no weight; neither can the commission accept testimony as to a scarcity of operators, if it appears that higher wages would secure as many as are needed. The commission cannot postpone the taking effect of the law because compliance will be inconvenient or costly, nor can a suspension be ordered after the law has taken effect. It has been given out in the newspapers, though not in a formal statement, that the commission has received thousands of telegrams informing it that operators are plenty. As these telegrams appear to have had their inception in a request sent broadcast by an officer of the Order of Railway Telegraphers, and as no evidence is adduced to support the statement as to the number of operators available it remains to be seen how much force it should have. In his telegram to the commission one of the operators said that "10,000 telegraphers were being turned away by the railroads" and he pleaded that "the law should remain as it stands for humanity's sake." It is greatly to be regretted that this law was not subjected to a little more rational discussion before its terms were crystallized. "Humanity" would be much better subserved by the application of more rational methods of improvement to the telegraph and signal departments of most of our railroads, than by a "strike law" which gives some men too little work and to others allows much. There is evidence a-plenty that in Maryland, where an eight-hour law for telegraphers has been in force for a year or two, the charge has done little or nothing to promote increased safety while some of its results have been demoralizing, as where a man works eight hours a day for one company and another period of eight hours for another. In putting such a strict construction on the law the Interstate Commerce Commission seems to be only following the policy which it has adopted with rate and tariff questions and all other points which have arisen since the amendments of 1906 were passed; and the strict construction would seem to be one which the courts would be likely to sustain. But to appeal to Congress for a modification will probably be as futile as were the appeals for more rational treatment of the question a year ago.

INCREASING THE CAPACITY OF THE BROOKLYN BRIDGE.

The Brooklyn Bridge is the most congested passenger terminal in the world. For half an hour on four afternoons of every week, from 5.40 to 6.10 p.m., passengers come into the Manhattan terminal at the rate of 1,000 a minute. This does not include those who walk across the bridge. For years it has been the practice during rush hours to carry passengers bound for points on the elevated railroads in Brooklyn across the bridge in trains of bridge cars operated by cable, necessitating a change at the Brooklyn terminal. An article in another column describes the most important physical changes which have been and are being made to increase the capacity of the bridge. The extension of the Manhattan terminal

over Park row, which was put in service on January 27, has made it possible to run elevated trains from Brooklyn to and from Park row direct during the whole day, doing away with the change at the Brooklyn terminal. The chief engineer of the Public Service Commission for New York City, in a report to the commission published last Saturday, criticised the new system and urged a return to the old method of running trains of bridge cars, on the ground that a test made on February 3 showed that the new service does not furnish sufficient capacity to do the work required, and that with it it would be impossible to carry as many people as were accustomed to use the bridge before the subway tunnel to Brooklyn was open. The principal reason for arriving at this conclusion was the fact that a bridge car being wider and having center doors thus saving the space which would otherwise be used in the middle of the car by seats, can accommodate more people than an ordinary elevated car.

In answer to this report of the commission's engineer, the Bridge Department of the city, which has had direct charge of the Brooklyn Bridge improvement, on Monday, February 17, between the hours of 4 and 7 p.m., made a count of passengers using the elevated and surface lines on the bridge and a comparison of their number with the number of passengers who by actual count had used the bridge during the same hours on the afternoon of Thursday, October 10, 1907, before the Brooklyn subway was in operation. It should be observed that Monday is the day of heaviest travel of all the week.

The surface lines in the February count ran 987 cars in the three hours, or at the rate of 329 cars an hour, which is 26 cars more than were run in the October count. These cars carried 5,321 less passengers than were carried during the corresponding three hours in October. The elevated lines between the same hours ran 1,026 cars, carrying 59,994 passengers, as against 700 cars carrying 57,207 passengers in October, an increase of 326 cars and 2,787 passengers. The comparison, both for the elevated and surface lines, is affected by the fact that in October the local traffic across the bridge was carried in elevated cars, but now is carried in trolley cars. In the three hours on the afternoon of October 10 there were 4,518 such local passengers carried on the elevated, so that the increase in the number of people who used the elevated lines for through srvice on February 10 over October 10 was really 2,787, plus 4,518, or 7,305. Correcting the comparison, from the standpoint of the trolley traffic, the 4,518 local passengers must be added to the decrease of 5,321 trolley passengers, making a total falling off in through travel on the trolley cars of 9,839 people. The through elevated service over the bridge has apparently attracted a total of 7,305 passengers to the elevated who formerly used trolley cars. The net decrease in the number of people carried over the bridge on both elevated and trolleys was 2,534, which may fairly be said to represent the number of passengers who formerly used either one service or the other on the bridge, but now use the subway tunnel. This number would represent the loss in through travel to the Brooklyn Rapid Transit, which operates the elevated lines and all but two of the trolley lines. In order to gage the whole effect of the subway tunnel on the whole business of the company, however, it would be necessary to know the increased number of passengers who take the Brooklyn Rapid Transit elevated lines and trolley lines at or in the neighborhood of Borough Hall, Brooklyn.

These figures of the number of passengers carried across the bridge are surprisingly close to the previous estimates made by the Bridge Department of the new service as compared with the old. They show that the present elevated service, which is the crux of the operating problem at the bridge, has a greater capacity than the old service of bridge shuttle trains.

Further improvements to the bridge will increase this capacity. Some of these are outlined in the accompanying article. In addition, contracts have already been let for eliminating the grade crossing of trolley cars at Sands street at the Brooklyn terminal of the bridge. When this crossing is done away with the ease of moving the trolley cars across the bridge will be increased. It has already been arranged with the Brooklyn Rapid Transit that, as soon as this change is finished, a service of elevated trains originating at Sands street will be begun, to which people crossing the bridge by the local trolley service can transfer direct and take elevated trains not already filled with passengers.

The arrangements which have been made for handling the crowds at the large Manhattan terminal are interesting. The general plan of the terminal is shown in one of the drawings with the article. Passengers come from the street up a stairway 40 ft. wide to a mezzanine floor, from which there is access to each of the different train terminals, one for each of the elevated lines. One of the greatest problems is to handle the crowd when getting into the trains, for it is here that the most disgraceful crowding occurs. Experiments are being made to meet this situation. Two iron fences or railings have been built parallel to the tracks, one with a 1-ft. clearance between it and the edge of the platform, the other about 4 ft. further back from the platform's edge. The 1-ft. clearance between the nearest railing and the edge of the platform, together with the 8 in. of additional clearance between the edge of the platform and the sides of the cars, leaves a total clearance wide enough to prevent accident to any one who should happen to be caught between this railing and a train. There is an opening in this nearest railing opposite the gates of the cars when they are lying in the terminal. In the morning rush hour the outside railing will be opened opposite this same point to let passengers out of the train.

When the rush of travel is inward instead of outward, that is, in the afternoon, passengers of incoming trains are unloaded on outside platforms, and this opening in the second railing will be kept closed. At a point opposite the middle of each car there is another opening in this outside railing, through which, whether there is a train ready or not, passengers will be allowed to go, walking from here to the open part of the inner railing nearest the track and opposite the car gates. The space between the two railings is designed to be just large enough to hold half a carload of passengers, the passengers for the other half of the car being in a similar space facing the other way. The total capacity of all these spaces is the capacity of the trains. When one of these spaces is filled the opening in the outside railing is closed by an iron bar and no more passengers are allowed to crowd inside. When the train pulls up to the platform, the passengers who arrived first are nearest the door and the passengers who arrived last furthest from it. Instead of crowding toward the two car platforms from three directions, all going to one platform proceed in the same direction, those coming to the adjoining platform of the other car, coming in the opposite direction. The train can be loaded in this way in 40 seconds. In order to make passengers walk as fast as possible the interval which now exists of about 8 in., between the edge of the station platform and the edge of the car platform is to be bridged by an iron grating filled with carborundum to prevent people's feet slipping, and lighted from underneath by an electric light. An interesting fact in this connection is that the spaces designed to hold half a carload each will probably be made larger for some lines than for others. It has been found that the passengers on the lines serving the better parts of the city will not crowd together as closely as those bound for other parts.

The principal disadvantage of the system of running through elevated trains on the bridge is that for 20 to 30 minutes on Monday, Tuesday, Wednesday and Thursday, the four busy evenings of the week, a delay of two or three minutes to an elevated train will result in blocking the platform. That is, so many passengers will arrive in this time that the entrance gates will have to be closed until the platform is cleared. It would appear, however, that this is a defect which will steadily grow less with experience. In order to prevent a crowd thus detained from rushing the entrances where the chopping boxes for tickets are, partitions have been built in the entrances to prevent shoving from side to side. If this plan is not successful, these partitions are to be extended out from the railings so as to effectually separate the crowd 5 or 6 ft. away from the barrier.

A further improvement to increase capacity is the installation of automatic block signals across the bridge. This is already under way. These are to be worked on a new system developed especially for this use. Each block is 700 ft. long. This is to be the minimum interval between two trains, but each block is divided into seven sections of 100 ft. each, so that as soon as a train in the block ahead moves 100 ft. ahead, the following train can move 100 ft. ahead also instead of having to wait until the leading train has cleared the 700-ft. block. This system, it is believed, will give the maximum efficiency of the tracks. Still other improvements are to be made. The yard at the Brooklyn end of the bridge is to be rebuilt to allow trains to be more promptly and efficiently handled and better interlocking mechanism is to be put in at the terminals to provide for quicker operation of switches and signals.

In one sense these improvements are temporary, for when the subway between the Brooklyn and the Williamsburg Bridge is finished, there is to be through service over the two bridges as a loop. The immediate changes, however, are of special interest as examples of the way in which the largest and most violent body of concentrated rush-hour traffic in the world is handled.

STEAM AND TROLLEY DURING HARD TIMES.

The present period of financial and industrial strain will, before it ends, test for the first time in this country the relative strength of the steam railroad and the electric railway in resisting, as investments, the shock of hard times. It is true that in the latter part of the year 1893 and the twelvemonth following, there was financial depression that rested heavily upon the railroads and, in less degree, upon the street railway properties also. But at that time the street railway had barely emerged from its "horse railroad" character. It was still in its infancy of the "novelty" traffic that increased receipts; it had not settled down to business; and what is of more importance in the comparison, it had not reached its high expansion of these later times when, in many quarters, it competes with the steam lines. But now steam and the trolley, with both their systems greatly developed, face together the ebb of the industrial tide which has been running out for two months. Such a period is a short one for the test. The returns from the steam roads are still pretty meager; from the electric roads, only fragmentary. But from the best information available, it appears that a group of eighteen fairly representative electric properties actually *increased* their earnings 2 per cent. in December, as compared with December, 1906, while 61 steam roads decreased 4.28 per cent. in the same month. In January, six electric properties (including the Chicago elevated lines) increased their earnings 3.6 per cent., while 53 steam roads (including certain lines in Canada and Mexico) decreased 7.45 per cent.

These returns, viewed as statistics, are unsatisfactory. We are lumping city elevated lines with interurban lines, and including with the steam roads certain properties in Canada and Mexico which are showing gains instead of losses. The entire number of companies is too small to neutralize these imperfections. But from one quarter, the steam and trolley lines of the New York, New Haven & Hartford, we have returns on so large a scale and representing such a diversity of operating conditions that the figures are very suggestive, even for a brief period.

Alone among steam railroads, the New Haven has made investments in trolleys which may justly be called vast. It holds them in four states, and in two states, Connecticut and Rhode Island, it has almost a street railway monopoly. Its trolley lines represent a market value of considerably more than $100,000,000;; they comprise more than 1,300 single track miles; their gross receipts are upwards of $15,000,000 a year; and they include lines of all types—urban, suburban, cross-country, long distance and short distance, parallels to steam roads and laterals. January, 1908, was the first month of traffic depression in which to measure the steam system against its trolley subsidiaries. Gross earnings from operation of the steam system, as compared with January, 1907, fell off $643,000, or 16 per cent. The trolley earnings fell off only $21,000, or 2 per cent.; and, in one of the four states, there was a positive gain. On both the steam and trolley systems, changes in mileage operated for the year were unimportant. In the year 1894, when the New Haven company first encountered fully the financial setback that began in 1893, its earnings—allowing for earnings of the Old Colony just absorbed—fell off for the whole year only $903,435, or a little more than 5 per cent. At that time the company had only a few miles of street railways, and comparative earnings then are meaningless. But the contrast between the 5 per cent. reduction of 1894 and the 16 per cent. January reduction of 1908 suggests the severe industrial depression in the New Haven's territory which its trolleys have just met with the slight reduction of a little more than 2 per cent.

Pushing the analysis further, it is to be noticed that the New Haven's great street railway system, particularly in Rhode Island and Connecticut, depends in a considerable degree for its earnings on the patronage of factory hands, for whom in places special groups of cars are operated at "rush" hours. That under such conditions street railway gross earnings should all but hold their own during industrial ebb seems strange on its face. But it is to be remembered that an equation of trolley earnings at annual periods means a loss of what, in normal times, would have been an increase; that to the trolleys paralleling the steam lines, particularly on interurban routes there has been perhaps a division of steam passenger traffic due to the lower trolley fares; and that the unemployed may for awhile, until idleness begins to pinch the pocket hard, use the trolleys freely. But even with such modifying elements, the retention of the New Haven's trolley business seems remarkable. It argues, for one thing, for the persistence of passenger business through hard times, as compared with freight, and also for the intensified relation of public necessity which the street railway has assumed—somewhat the same as the telephone in another field.

The more it is looked into, indeed, the New Haven example of comparatively undiminished trolley business seems but a strong illustration of a general truth that hard times hit the freight traffic first and hardest. The great loss of the New Haven in January last was in the freight traffic, the loss in steam passenger business relatively small. Going back again to 1893-94, one finds that the New Haven's freight receipts fell from $8,115,524 to $7,260,433, or somewhat more than 10 per cent. Allowing for the Old Colony merger; passenger business fell off from $9,807,545 to $9,761,201, or hardly at all. In the same period of industrial stringency, with due allowance for a nine months' report, the passenger earnings of the Boston & Maine actually rose from $7,801,352 to $7,894,968, while freight earnings fell $786,413, or nearly 10 per cent. The New York Central passenger earnings were almost unchanged, while freight earnings fell off $3,267,561, or almost 12 per cent. The Pennsylvania, however, lost about 15 per cent. in passenger receipts and about 12 per cent. in freight, being the exception that accentuates the rule in a somewhat similar group of eastern roads, the Boston & Albany reasserting the rule with about 8 per cent. loss in passenger and more than 17 per cent. in freight. It looks therefore as though in our hard times street railway earnings, almost all of them on our eastern lines derived from passengers, are to prove much more stable than those of the steam roads, and demonstrate even more strikingly than heretofore the general stability of passenger business as contrasted with freight. A few weeks more will tell the full story.

The New Haven returns, so far as they have gone, bring out another bit of comment. President Mellen has been censured by his critics, notably in Massachusetts, for nothing more severely than for his bold excursion into street railways. Many changes have been rung on the rashness of that venture, upon the size of the new liabilities assumed, upon the water solidified by the leases of the parent corporation, and upon reduction of its dividends as the ultimate result. The first returns in hard times now indicate that his trolleys are ballast rather than excess of sail and that it is the old line business, which he has been criticized for not sticking to, that has fallen away. As our troublous times go on it will be an instructive experience to see how far the stability of street railway earnings extends beyond the New Haven system and whether or not it includes, for example, the mixed freight and passenger long distance electric lines of the Middle West. It is one of many lessons that our hard times are to teach, and a lesson that bears directly on the future fiscal relationship of electricity and steam in the land carrying trade.

CONTRIBUTIONS

The Soudan Railroad from the Red Sea to the Nile.

Swissvale, Pa., Feb. 17, 1908.

TO THE EDITOR OF THE RAILROAD GAZETTE:

One of several disadvantages of living long in the world is that you become a sort of contemporary ancestor and you have the bitter experience of finding that your progeny forget you. I have just noticed in the *Railroad Gazette* of Feb. 14 an account of the railroad from the Red Sea to the Nile, in the Soudan, but nowhere in that account do I find mentioned the fact that the first suggestion for such a railroad, and the first rough survey for such a railroad, came from a former editor of the *Railroad Gazette*.

Many years ago a young Major of Engineers in the Egyptian army was ordered into the Soudan. He survived, and later became the editor of the *Railroad Gazette*. This Major went into the Soudan by practically the route now followed by the new railroad, the account of which by Mr. Carpenter appears in your issue of Feb. 14; that is, he went to Suakin on the Red Sea, about latitude 19, and crossed the desert to Berber on the Nile. He, being somewhat familiar with railroad enterprises in the United States, was at once struck by the practicability of building a railroad from Suakin to Berber, and by the strategic value of such a railroad for military and for commercial purposes. He made an itinerary of his route, keeping directions by prismatic compass, estimating distances by rate of march, checking directions and distances by sextant latitudes and longitudes, and getting elevations by aneroid barometers. The result was a quick, rough survey, sufficiently accurate for a preliminary reconnaissance. He found that the distance from Suakin to Berber was about 240 miles. In the first 60 miles from Suakin he rose about 3,000 ft., and then for the next 180 miles descended gently and gradually to the Nile. He went through a somewhat rugged range of mountains by a pass not at all formidable or impracticable.

When the Major got to Berber, he sat down and wrote his re-

port to the War Office in Cairo, reporting such things as he had been sent out to observe, and then made an appendix, urging his notion that a railroad ought to be built from the Red Sea to the Nile on something like the line that he had traveled over. Had this road been built, troops could have been put into the Soudan from deep water by 240 miles of rail transportation, and probably the Rebellion of the Mahdi would never have taken place and Gordon would have died in his bed if his energetic temperament had permitted him to do so; the development of commerce with the Soudan would have been greatly advanced, and possibly that unhappy country would have been something like 50 or maybe 100 years in advance of its present condition, because the wars following the Rebellion of the Mahdi caused a destruction of population and a desolation which cannot be conceived of by anybody who has no intimate knowledge of the country.

The Khédive of Egypt at that time was Ismail Pasha, who was a very able man indeed, but came far short of being a great man. He was not permitted to keep a navy, and, obviously, was not willing to put the key of the Soudan in a deep water port far down the Red Sea, and so endeavored to hold the Soudan by the tedious and costly line of the Nile Valley; and we know the result.

The young Major's report, with the sketch of his itinerary and with the barometric profile, was printed at the War Office in Cairo, and something of it appeared later in the Bulletin of the American Geographical Society, in the *Railroad Gazette* and in *Engineering News*.

When Gordon was besieged at Khartoum, and England reluctantly decided to do something for his rescue, the project of building a railroad from Suakin to Berber was taken up, and at that time it was spoken of in the English newspapers as the "Prout route." Some light railroad material was shipped out to Suakin, and, if I am not mistaken, a few miles of road was laid inland from Suakin. But while it would have been easy to build the road before the rebellion and in times of peace, it was a different thing to do in the face of an active enemy, and the project never went very far. That route for the relief expedition was abandoned and the expedition went up the Nile.

Years later, after the English had thoroughly established themselves in the Soudan and had restored peace and had introduced good government and security to life and property, they took up again the project for the railroad from the Red Sea to the Nile, but they abandoned Suakin and went a little farther north to a better harbor, where they established Port Soudan. They wisely carried the line farther south than the pass by which the Major had gone through the mountains, and so got better grades and lighter work, and having gone so far south they naturally made the Nile terminus at the mouth of the Atbara, between Berber and Khartoum. So instead of a line 240 miles long, as the Major had estimated, they made it 332 miles, but they undoubtedly got a much better line.

This page of history may be new and interesting to some of the present editorial staff of the *Railroad Gazette*, and may possibly amuse for a few moments some of its readers. H. G. PROUT.

Steel Car Design.*

F. W. Brazier (N. Y. C. & H. R.).—I would like to emphasize the importance of standardizing steel cars so as to reduce the number of designs. I can see no reason why we should not have a standard length of flat car, coal car and drop-end gondola car. There is a tendency among car designers to have just enough difference in the design of cars to make them call for a great many different parts for repairs. Not only does this apply to steel cars, but it should apply to what is known as the American Railway Association standard box car. A box car that is suitable for one trunk line could be made standard throughout the country; but to-day each road has its own standards for doors, trucks, size of sills, kind of roofs, and different makes of couplers, which I think is unnecessary. Not that I would cut out competition in such matters, but I believe many of these parts can be standardized as well in steel cars as in box cars.

We have found that the steel cars we have had in accidents can be repaired and in many cases put back in their original shape at a reasonable cost. They certainly will deteriorate fast if allowed to remain idle, and I would suggest that steel cars be kept in service in preference to wooden cars, in these days when there is not such a demand for cars.

One of the greatest drawbacks has been to find a paint that would prevent rust. Our experience has been that many of the steel cars began to deteriorate at the joints from, I believe, lack of proper leading or some treatment for stopping corrosion. Possibly this may be overcome in the future. It is only a few years ago that we began to use steel stake pockets on our coal and flat cars, with results well known to us all; they simply rusted to pieces, and to-day nothing remains but streaks of rust in place of the steel. These have been condemned and malleable iron used as a substitute. I believe steel construction for baggage and postal cars, or in fact all passenger service cars, will be the standard of the future, because cars in this service will have better care taken of them.

Twelve months ago car manufacturing companies were filled with orders and were not able to take additional orders for many months to come. To-day, with many of the car manufacturing companies' plants closed down, and with all railroads economizing and at least 200,000 empty freight cars standing on side tracks, there is time for us all to investigate and look over idle equipment to see what, if any, are defective and to plan improvements.

G. R. Henderson.—Mr. Waitt speaks of a design to carry all the load on the center sills. This must depend very largely on the type of car. Where we have a car with sides eight feet high there is a great strength available to support the load. I think under conditions like that it would be manifestly unwise to design our cars so that the entire load is carried on the center sills. When you consider a hopper car, with the deep bolster possible, you will see that there is no difficulty whatever in transferring the strain from the side sills to the center plate. In other words, the design of the car should depend on the service for which it is intended.

Mr. Waitt makes a point of the necessity of keeping down the various sizes of parts so as to reduce the amount which must necessarily be kept in stock for interchange repairs in the shops, etc. I cannot second this too heartily. Anyone who has had to do with car repairs, particularly in the West, knows the difficulty of getting standard shapes for repairs to these new types of freight cars. It seems to me that the suggestion that merchantable shapes will be generally more acceptable than pressed steel shapes is a very good one. I think that the shapes of structural steel work used in the various industries in this country will indicate the class of merchantable shapes which may be used in car repairs. We should try to regulate our standard shapes so that we will be in a position to repair almost any kind of a car by using these merchantable shapes. I think that this club should initiate some action toward unifying the construction of steel cars, and I do not know of any better way than for it to suggest this subject to the Master Car Builders' Association committee as a subject for action at the meeting of the association next summer.

It is important that the standard sizes be amply strong. Some time ago I prepared the following specifications for sills of 50-ton steel hopper and flat cars:

"For hoppers, the body is to be proportioned for carrying 125,000 lbs. uniformly distributed between bolsters, in addition to the dead weight of the car. For flat cars, the sills are to be proportioned for carrying 125,000 lbs. uniformly distributed in addition to the dead weight, and also for 75,000 lbs. concentrated on a line across the car at any point between the bolsters, the side sills being considered as carrying the same proportion of load as the center sills, to allow for concentrated applications in loading heavy objects.

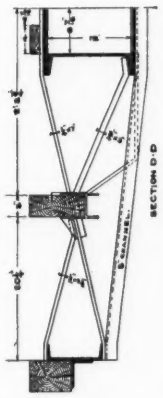
"In both types of car the center sills and draft attachments must be proportioned for a force of 100,000 lbs. pulling, and 200,000 lbs. buffing, and strains due to either or both the horizontal forces and the vertical loading combined must not exceed 12,000 lbs. per square inch in tension (net section), or 12,000—1/r in compression where 1 = the length and r = radius of gyration, both in inches. The maximum rivet shear must not exceed 8,000 lbs. per square inch, and the rivet bearing, 16,000 lbs. per square inch."

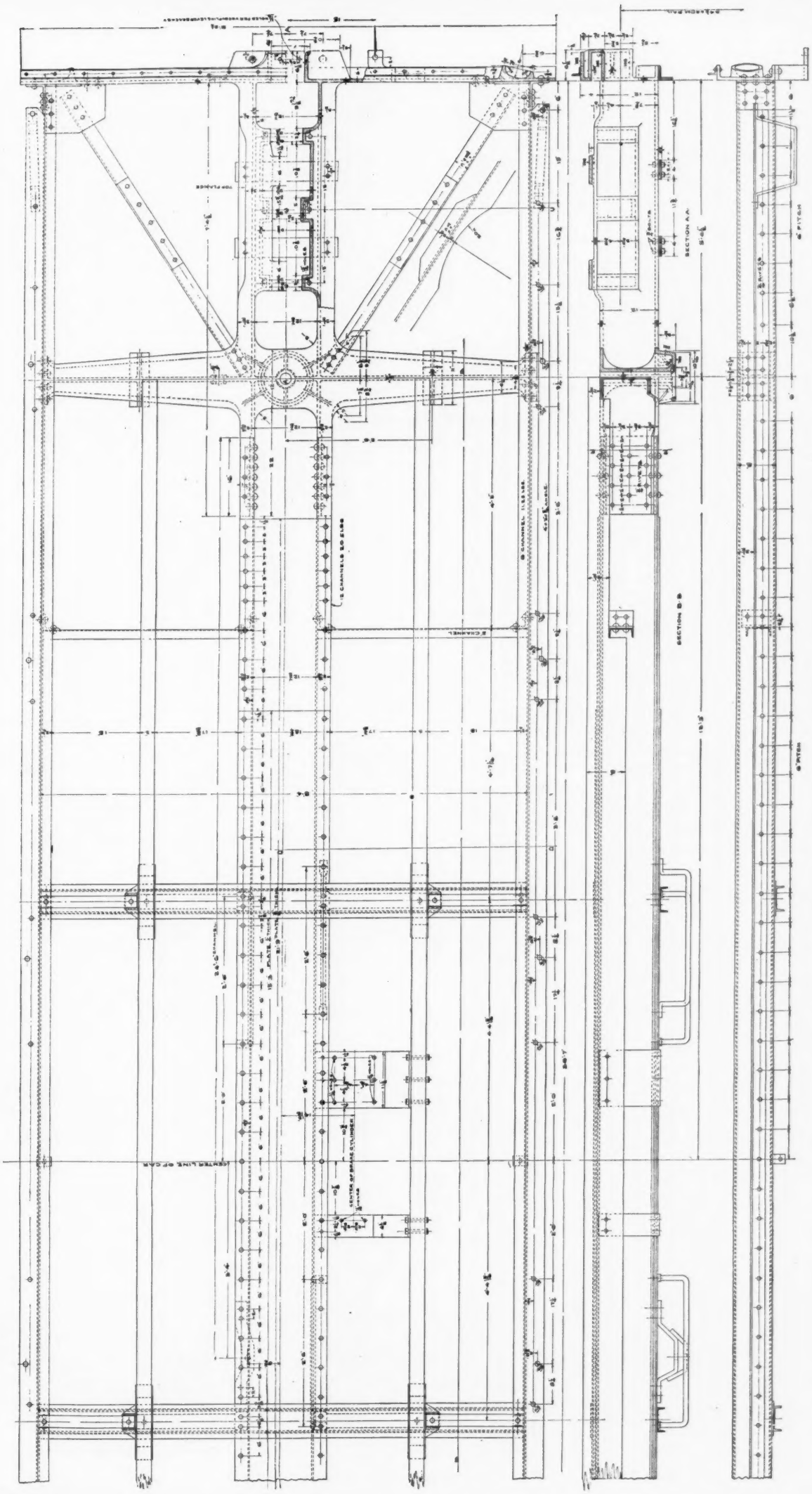
There recently appeared, in one of the engineering journals, a suggestion that 500,000 lbs. buffing strain be provided for. In the same article the author states that he would work up to the elastic limit of the sill on such an allowance. That actually brings it to the same figures which I have here stated, viz.: 200,000 lbs. with 12,000 lbs. allowable strain.

Mr. Waitt refers to the great carrying capacity and reduced traction in large capacity cars as a strong argument in favor of steel car construction. I agree generally with this, but I would call attention to the fact that some years ago there were wooden hoppers of 30 tons capacity which, I think, weighed about 30,000 lbs. Now, if you take the present designs, you will find that they run about 40,000 lbs., so that with the one-third more weight per car we get two-thirds more carrying capacity. I think that is well worth the extra expense, when you take into consideration a great many other points in favor of the larger cars.

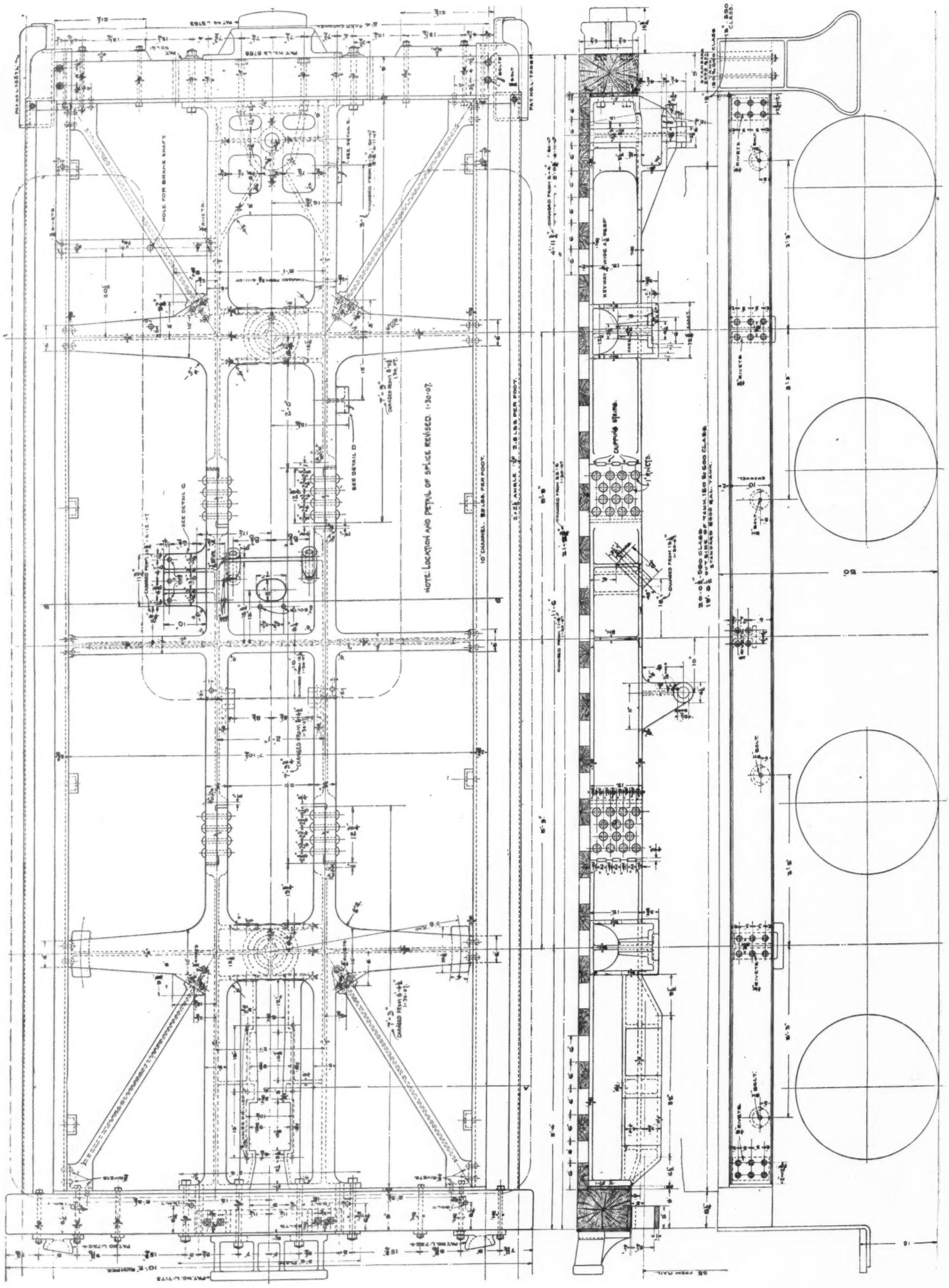
Now we come to the question of cost. That is a great bugbear to many railroad companies, especially at present. I know of a railroad that got some figures on steel cars and also cars with wooden frames, and when it was found that for the same money they could obtain a great many more wooden cars, it appealed so strongly to the "powers that be" that they said "well, we will put in the steel cars a little later, but now buy wooden cars which will give us more cars for the same money." In the early part of last year we got bids on steel cars, and the prices ran a little less than three cents a pound. You can get very little structural steel erected for less than four cents a pound, and even at that price very few people would think of putting up a wooden building nowadays. In the long

*Discussion of the paper on "The Era of Steel and the Passing of Wood in Car Construction," read by A. M. Waitt before the New York Railroad Club, Jan. 17.

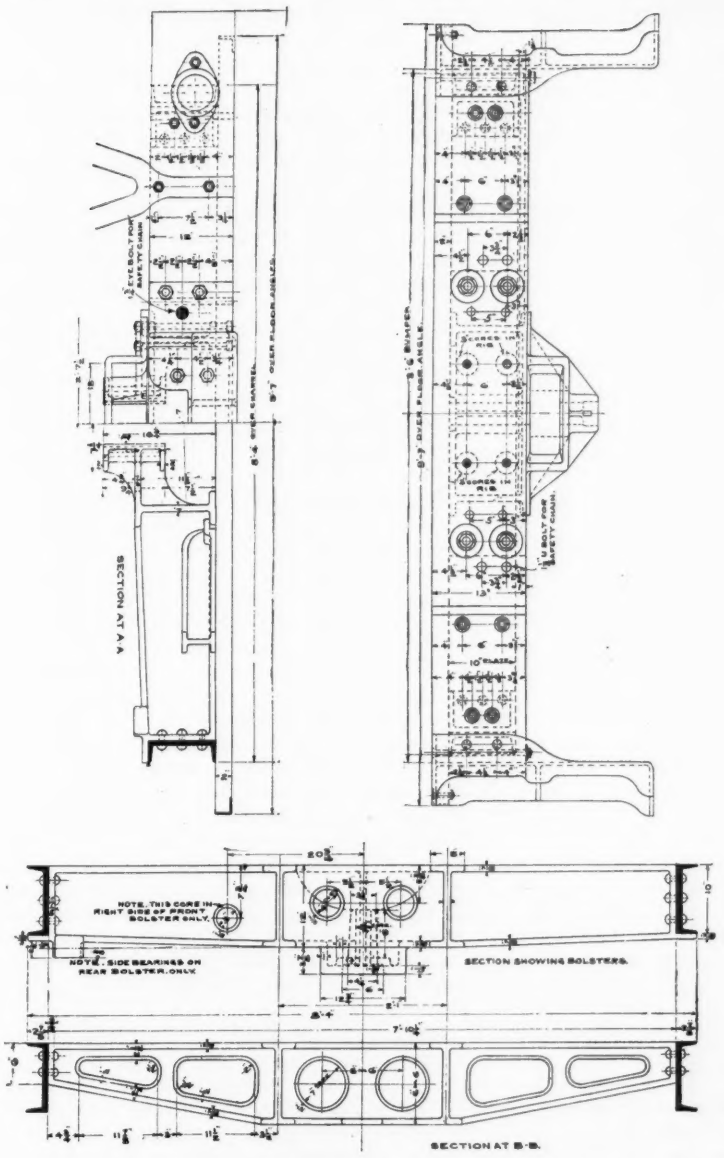




Cast Steel Bolster Applied to Thirty-Ton Box Car; Central of New Jersey.



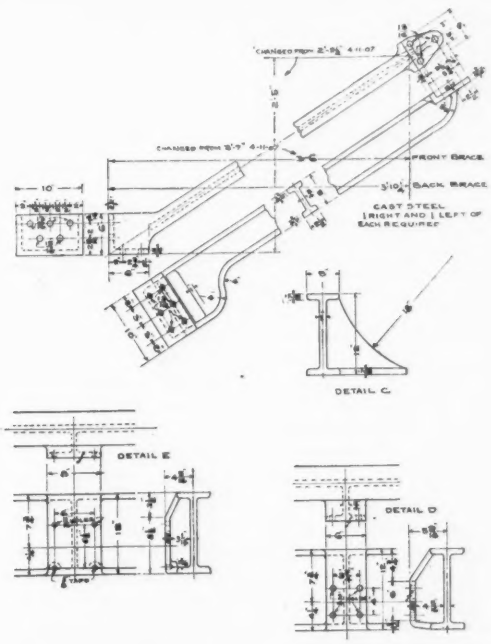
Cast Steel Tender Frame; Central of New Jersey.



Sections and End Elevations of Cast Steel Tender Frame.

run the saving on the steel car is certainly very large, and it seems to me that it is perfectly logical that railroads should put up steel cars rather than continue their old wooden cars on side tracks and hold them there for months for repairs.

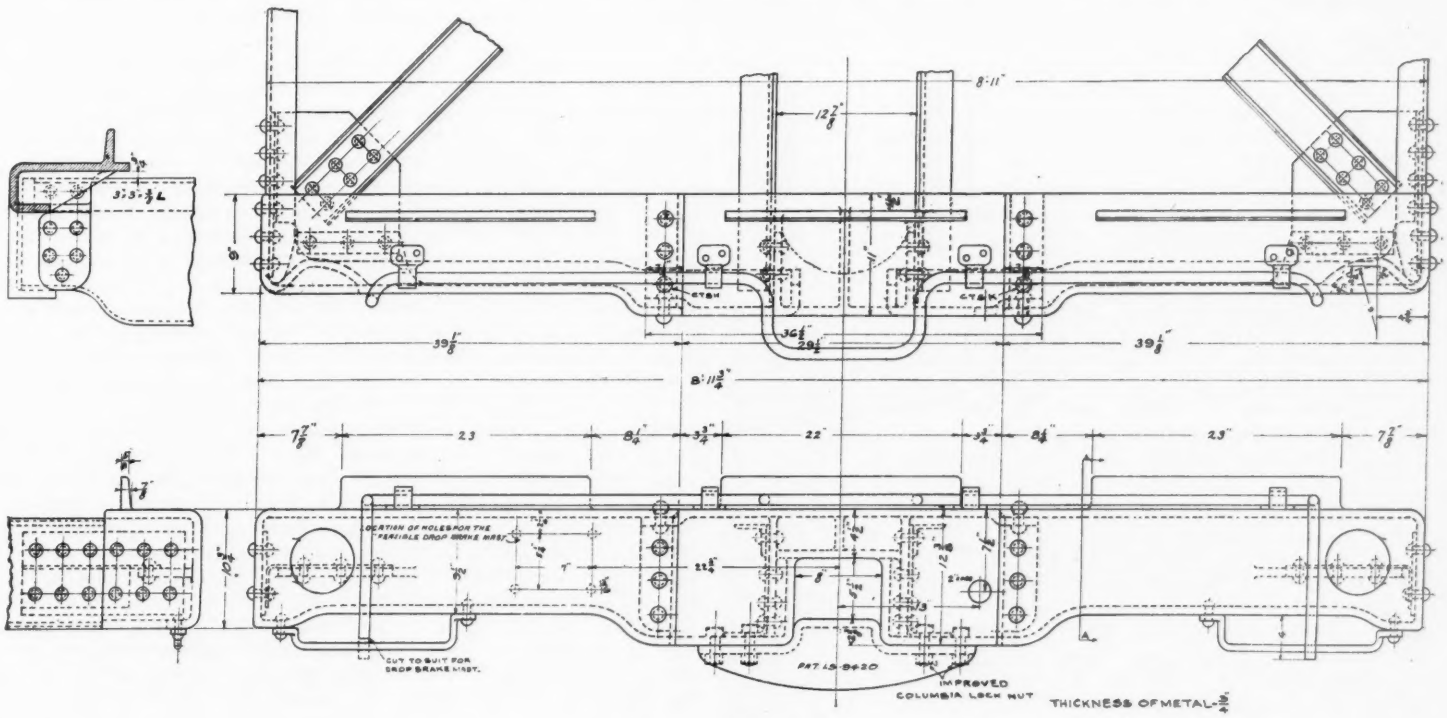
William McIntosh (C. of N. J.)—I notice Mr. Waitt mentions the earlier construction of steel cars, built in 1897 to 1900, and a departure from that construction since seems to be largely on account of the difficulty that was encountered in obtaining the pressed steel forms for repairs. I found those same difficulties and rather favored the change to the structural steel forms with the expectation that a good many troubles would be eliminated. We did find less difficulty in making repairs, but I want to pay a tribute to the pressed steel car and say candidly, that as far as my observation goes it has given as good an account of itself as any cars that have been produced since; that is, taking into consideration the weight and the results obtained. It seemed to possess a good many elements of



Details of Cast Steel Tender Frame.

resistance that the latter cars do not have to the same extent. In other words, it had some of the interesting features of an old tin can, that it would shove up under stress and if given a little time it would stretch out again like an accordeon and assume its original form. However, I think some of the difficulties we have met with in the later construction are owing to the quality of steel that has been furnished. No doubt a good deal of ordinary Bessemer has been pressed into service in car construction under the stress of scarcity of material, where we supposed we were securing the open-hearth product.

Mr. Waitt comments on the slowness of some of the New England people in taking up the larger forms of cars. This was perhaps owing to the lack of confidence in the cast iron wheel which was being loaded up to its capacity. Recent changes have strengthened



Cast Steel End Sill.

this wheel materially and increased confidence in its ability to carry additional weight.

I am disposed to take exception to Mr. Waitt in his remarks where he mentions three designs of different construction, but does not give cast steel any consideration at all in modern construction. I believe a fourth design ought to be brought in embracing more or less cast steel, which is quite a factor in car construction at present and, I believe, is destined to cut a much larger figure. It is possible in designing cars for withstanding great resistance and weight to use a very considerable proportion of cast steel. We have made some strides in that direction in the construction of cast steel tender frames. My attention was first attracted in that direction by reason of the rapid deterioration of the structural steel frames from corrosion; we found that we could produce a very strong and substantial frame of cast steel, or a combination of cast steel and structural steel. We built some tender frames of this kind two years ago which have been in constant and hard service since and have not shown any indications of weakness or being affected unfavorably by corrosion. Mr. Waitt must, therefore, leave a niche for that design.

In the matter of repairs to steel cars, but little need be said. It only requires some capable men of the laboring class, properly directed, to do that work and do it well. As has also been said, the proportion of repairs to steel cars is very much less than that to wooden cars.

As to standardization, this is a good time to suggest it, and a great deal can be done in that direction. Of course, as in all new developments, there is a tendency toward introducing many different ideas, and everyone thinks his is the best. He soon finds that somebody is doing as well, if not better; and then the disposition to compromise comes in and there is ultimately the survival of the fittest. We have had experience enough now to get together and appoint some committee with the necessary capacity to select the best and embody those specifications in some form of construction that will meet the requirements of all companies. Then it will remain for the higher officers to secure its adoption and thus eliminate a great deal of the useless designing now going on.

We are satisfied from our experience with the use of cast steel that a similar design to the one used in tender frames can be used in car construction. We have not done much in the way of car design except in the matter of cast steel end sills. We have introduced a great many of these, with much satisfaction. In the early construction of steel car frames, it was not thought necessary to put a great deal of strength in the end sills, as it was figured that the buffing was supported by the center sills. We all know that cars are not always handled in that manner and that they are subjected to a great deal of unnecessary stress. And it is advisable, for self-protection, to provide cars with strong enough ends to resist a considerable amount of unfair treatment and, I think, it is only with cast steel end sills that this can be accomplished. Structural steel ends are either broken or distorted under the force of the cornering blow they so often get in switching, while a well designed end sill of cast steel is not easily distorted under punishment of this kind and seldom breaks.

The cast steel end sill, tender frame and the application of the latter's principle features to a box car under frame, as mentioned by Mr. McIntosh, are shown in the accompanying drawings. Of a number of the tender frames built, some have been in service for two years without developing any indications whatever of weakness. In this construction the members carrying the draft gear attachments are cast in one piece with the body bolster. From the bolster toward the center of the tender extend short I-beam sections to which are riveted the intermediate framing of the tank, which in turn carries the water scoop, etc. The draft gear used in these designs is the ordinary tandem spring type and also the transom gear. The end sills are of wood and plates, and the side sills are channels.

In applying the same bolster and draft gear principle to a freight car, channels are used for intermediate sills largely as a matter of convenience in construction; cast steel center sills could be used if desired. The point considered especially advantageous is the combination of bolster and center sills extending from the bolster to the end of the car, and the short channel-shaped extensions toward the center of the car which make it easy to build up the intermediate framing in any manner desired.

A number of cars have lately been built with the design of cast steel end sill shown herewith, and it has been found entirely satisfactory. It is made either in three parts or in one casting. It has the advantage, as compared with wooden or light structural steel sills, of being strong enough to resist cornering.

John M. Goodwin (Goodwin Car Co.).—The pioneer steel dumping car in this country was built by me in 1894. Its weight was 24,000 lbs., with a capacity of 40,000 lbs. It was of structural steel and operated by air pressure. After numerous experiments this capacity was increased to 60,000 lbs., and the weight to 46,000 lbs. A few cars of this design were built by the Goodwin Car Co. in 1895. Again, after thorough testing and experimenting, profiting by the service experience with the first cars, I produced, in 1896, a steel car in which the weight was reduced to 43,000 lbs. and the capacity increased to 125,000 lbs. This was entirely of structural steel combined with malleable iron and cast steel. All parts were coated before being assembled with a carburet compound mixed with graphite, with very satisfactory results.

In the early part of 1895 the Goodwin Car Co. began to exhibit the operation of their cars to the Carnegie Steel Co., and for several months the cars handled almost every kind of material handled about the furnace yards, including pig iron, rail ends, slag, coal, coke, ore and all such material. I personally operated these cars during this entire period, and made copious notes as to costs and methods of operation.

As a result of these exhibitions, the Carnegie Steel Co., about a year later, built two all-steel hopper cars of structural forms in its own bridge shops. The weight of these cars was 39,960 lbs., with 95,000 lbs. capacity, estimated to safely carry 125,000 lbs. if the roadbed would allow it. The company exhibited these two cars at the M. C. B. convention at Saratoga in June, 1896. Up to this time the Goodwin company had had only its own equipment to refer to for information as to service requirements.

In 1897 the Carnegie Steel Co. made an arrangement with the Schoen Pressed Steel Co. to design a pressed steel car on the lines of the two structural steel cars of hopper bottom type, which had proved too expensive to sell. The understanding was that the weight must be reduced something over 6,000 lbs. and the capacity increased to 100,000 lbs. The Schoen company was then making pressed steel stake pockets and center plates and was just starting to build pressed steel trucks. Mr. Hanson, the designing engineer of the Schoen company, designed and patented the pressed steel forms from which the Schoen company built a number of pressed steel cars of the hopper bottom type in 1897. They weighed 34,100 lbs., with 100,000 lbs. capacity. These were the first pressed steel hopper cars built in this country. As Mr. Waitt has stated, these cars "proved somewhat too light to stand in an entirely satisfactory manner the strains of service."

The weight of pressed steel cars has gradually been increased, until to-day it appears to contain sufficient material to meet ordinary service requirements. In a car that has a carrying capacity of 100,000 lbs. and weighs much over 41,000 lbs., the earning capacity must be increased through a special design which saves labor in unloading.

In my research in several foreign countries, I found many designs of steel cars and was able to gather considerable data. I took measurements and photographs throughout Germany and France and even secured full information in the Far East, where steel coal cars were in general use, particularly in Burmah. In considering all of this foreign investigation, I find that my strongest point consists in knowing what not to do.

The problem of building cars for railroads in the United States stands absolutely by itself. Our railroads must have to-day a car that they can buy at a price approximating the present cost of a wooden car for its life service.

As something over 70 per cent. of the freight of this country is coal, if railroads can secure for their coal service a simple two-sill design, strong in construction, with discharge hoppers sufficiently enlarged over the present designs to allow free discharge of coke as well as of coal, and if this design produces a car that will carry its 110,000 lbs. of coal with a dead weight not much over 41,000 lbs., I believe that the limit of economy in capacity and in weight will have been reached. The only remaining question will then be the proper distribution and quality of material used, and the class of labor employed in meeting the above requirements.

William Marshall (Anglo-American Varnish Co.).—This subject in different forms has come up a number of times of late, and the matter of a proper protective coating is always sure to be brought to the front. Mr. Waitt practically ignored it in his paper, because he is thoroughly imbued with the idea that steel cars and cars of metal construction have come to stay. Mr. Brazier, who is perhaps more intimately connected with the matter of car building at the present time, touched upon it but slightly. Mr. Goodwin referred to it in the form of pigment he uses on the plates in his cars. Whatever may be done by the Master Car Builders' Association, or whatever association may have the final adjustment of this matter, the question of the protective coating must have full consideration. I do not know that anyone can say what may be the best coating to apply to metal. The difficulty seems to lie in the difference between a metal surface and a wooden surface. All paint has a vehicle for the pigment; the vehicle in which good pigment is ground is linseed oil. If you apply paint to a wooden car, the wood begins to absorb the oil and the paint grips the wood so that it stays there for an indefinite period. Now, when you apply paint to metal it is very different. Metal has very little affinity for linseed oil. It lies on the surface like a glaze and has not the "bite," if I may use the term, on the metal. No matter how good a paint you use, if it has not that clutch on the metal its life is very short. The idea I have is a partial remedy. I suggest that before the parts of the

car are assembled a coat of raw linseed oil be applied to the plates while hot, because while iron is heated the pores are opened up in such a way that linseed oil will be absorbed. Subsequent coats of paint will cling to the oil.

A number of years ago I recommended a paint made of linseed oil and lamp black as being the most desirable for painting iron and steel structures, for the reason that lamp black absorbs more linseed oil in proportion to its weight than any other pigment. This paint has proved to be the most durable and is the nearest approach to perfection in painting metal cars. The Central of New Jersey uses lamp black as a color on all its freight cars.

W. R. McKeen, Jr. (Union Pacific).—The character of steel being so entirely different from that of wood, a great many advantages and possibilities are obtainable in a steel car design which were impossible with wooden cars. The use of steel is no reason why there should be a material increase in weight; my opinion is that it should decrease the weight. I make the following suggestions for steel passenger car construction:

1. Round roof, saving weight and giving greater strength.

2. Induced or mechanical ventilation, instead of the gravity system; intake of fresh air at the floor of car and exhaust ventilation at the top.

3. All laterally disposed steel should be utilized for strengthening the car frame in resisting shock, including side sills, plates, steel side, braces, etc. Sufficient area of cross section provided in center sills for small or ordinary shocks.

4. End construction such as to preclude the possibility of telescoping.

As to Mr. Waitt's item of the sweating of steel box cars with ordinary materials, this is limited to the amount of water contained in the air confined in the car; the volume of water in this condensation is self-evidently very insignificant. With the transportation of moisture bearing materials, however, there may be a slight increase of this condensation, but we have had two steel cars in service over a year, and there has been no damage from this cause so far. It is reasonable to suppose that the slight volume of water that might be condensed in the steel cars from such materials as potatoes, etc., would not be detrimental to the potatoes. Box cars, however, are not the proper equipment for shipping such materials as a general proposition. They should be shipped in refrigerator cars, or in such cars as are provided with proper means of ventilation, ventilation being an absolute necessity as a rule for such things.

Mr. Waitt speaks of the trouble from the increased heat incident to the use of steel box cars in railroad yards. We have at present three to four hundred steel cars in railroad yards, and we have experienced no practical trouble from this feature; I believe our hopper bottom and gondola coal cars, so-called "baldheaded box cars," will give off as much heat as box cars would.

It is true, as Mr. Waitt states, that some steel elevators are lined. However, it is also true that for many years it was considered that elevators holding wheat should be made of wood, inside and out, to protect this very valuable grain, but at present there are steel elevators without any lining, the grain coming directly in contact with the steel shell. If these steel elevators are a success, as they unquestionably are, there should be no question as to the practicability of steel cars in the wheat trade. In fact, our steel box cars were used in this wheat traffic for a while with great satisfaction to the shippers.

C. A. Seley (C., R. I. & P.).—It is believed that center sills strong enough to carry their proportion of the lading will also be strong enough to transmit the pulling and buffing stresses. The remainder of the load may then be calculated for the side framing and transmitted by the bolsters to the trucks.

There is not much to be hoped for in standardization of framing of steel cars if we can judge of the record in regard to wooden cars. Such cars were mainly designed by the owning roads who had it in their power to get together on standardization. The majority of steel car designs have been made by the car builders, and because of competition it will be difficult to unify designs. There is not much need for this as an economic proposition as regards interchange repairs. It has been found in repairs of cars of composite construction that two-thirds or more of the cost is for labor, leaving a small proportion for new material required. It is well known that heavy repairs of wooden cars reversed these ratios. This proves that the steel, though not indestructible, can in most cases be repaired and returned to service without much new material being required.

There is no doubt this is the era of steel and the passing of wood in car construction, but if in freight car design the sills, plates, posts and braces are of steel, it eliminates all of the expensive lumber, now difficult to obtain, and there is reasonable hope of securing suitable lumber for flooring, roofing, lining and sheathing for many years to come.

R. P. C. Sanderson (Virginian Ry.).—In 1896, a committee of the Master Car Builders' Association made ten recommendations which it believed should be followed by the designers of steel cars, as follows:

1. Specially forged, pressed or rolled shapes, cast steel, etc., or patented forms of construction are undesirable for cars to be used in general interchange business.

2. Steel and iron bars and shapes of standard bridge specifications and regular market sizes should be generally preferred, so that railroads and car builders can avail themselves of the competition in open market when purchasing.

3. Accessibility in the design is of the greatest importance in keeping down the first cost and maintenance; parts that are riveted together should be so arranged that they will be equally convenient for hydraulic or power riveting when the car is being built, or for field riveting in repair work.

4. In designing riveted work, it should be laid off with plenty of rivets, these to be spaced closely as in the boiler work, and with the same care to insure true, fair holes; hot rivets, well driven, and completely filled holes, as in first-class boiler work, if necessary.

5. If bolts are used to hold iron or steel parts in position, not merely to carry weight, they must be turned bolts (a driving fit), in carefully reamed holes, fitted with the greatest care.

6. Every structure has a foundation, every machine has a bedplate, every animal, bird, fish, and most of the higher works of nature have a backbone or spine on or around which the structure is framed; this cardinal principal of design seems to have been largely overlooked in freight car construction, and it is believed that the center sills of a freight car should be made its main strength and reliance, and that the entire load should be carried from the platform, the upper works being arranged simply as a housing to confine and protect the load.

7. To enable the center sills to withstand collision and severe shocks to the best advantage, these sills should be spaced so that they will be directly in line with the dead blocks, and thus take the buffing and collision shocks in direct compression. Also their depth should be such that at least the center line of draft and centers of the dead blocks will be within the vertical dimensions of the sills.

8. That care should be taken to avoid punching or drilling holes in the flanges of channels or I-beams where these are subject to heavy strains, especially tension or bending strains, unless additional material is added to compensate for this.

9. That with the change from wood to steel the necessity for truss rods no longer exists for cars of reasonable lengths, but that ample and sufficient strength can be obtained within reasonable limits of weights without the use of truss rods and consequent need of adjustment.

10. On account of the sweating and rusting of iron and steel, wood is preferable to iron or steel for flooring, siding and lining of merchandise and stock cars.

There is one other cardinal principle of design for steel cars, not mentioned by the committee, which I believe to be of the first importance. Wherever possible, parts and attachments, and also the means of attachment, subject to strains in collision shocks, etc., beyond their elastic limit, should not be strained in reversal, whenever it is possible to avoid this; when it is impossible, double or triple the usual margin of security should be allowed, and for this reason it is especially important to-day that collision shocks be transmitted to the underframing through dead blocks, and not through the couplers and draft attachments. The dead-blocks, so-called man-killers in the day of link and pin couplers, had a bad name then, and there was a strong sentiment against their use, based on humane consideration; but since the Interstate Commerce Commission says that no man shall go between cars for the purpose of coupling and uncoupling cars, and we have gone to the expense of furnishing automatic couplers, etc., it seems foolish to dispense with this most valuable protection to the steel underframe of the car from the excessive damage which will follow in a collision, whether light or heavy, when the dead blocks are not used.

The Fortieth Street Track Elevation of the Chicago Junction.

The Fortieth street track elevation work in Chicago of the Chicago Junction Railway, although not unlike much other track elevation work that has been done there, in its general features, is of special interest because of the construction by the Chicago Junction, as a part of the work, of branch lines for the South Side Elevated Railroad.

The Chicago Junction is a switching road, the chief function of which is to handle the Union Stock Yards business. The 40th street line runs east to connection with the Illinois Central on the lake front, and crosses the Lake Shore & Michigan Southern, the Chicago, Rock Island & Pacific, the Pittsburg, Ft. Wayne & Chicago, and the Chicago & Western Indiana, all of which secure connection to the stock yards through it. Built some 30 years ago, it is now in a closely-built section of the city, occupying the larger part of the thoroughfare from which it takes its name.

The South Side Elevated runs south to 40th street, where it turns east for four blocks, and then continues southward. It was desired to extend the service eastward in 40th street to the lake to traverse the populous residence district known as Kenwood, and

also to build a line westward in 40th street to the Union Stock Yards. The Chicago Junction agreed to build both lines and lease them to the elevated railroad company. For the eastward extension the Chicago Junction built a three-track line on its raised grade, the two southerly tracks being equipped for the exclusive use of the elevated trains. The westward, or stock yards, extension is the usual steel structure, which is being built above the steam road as far as Union avenue, two blocks from the yards, where it swings southward to enter the yards.

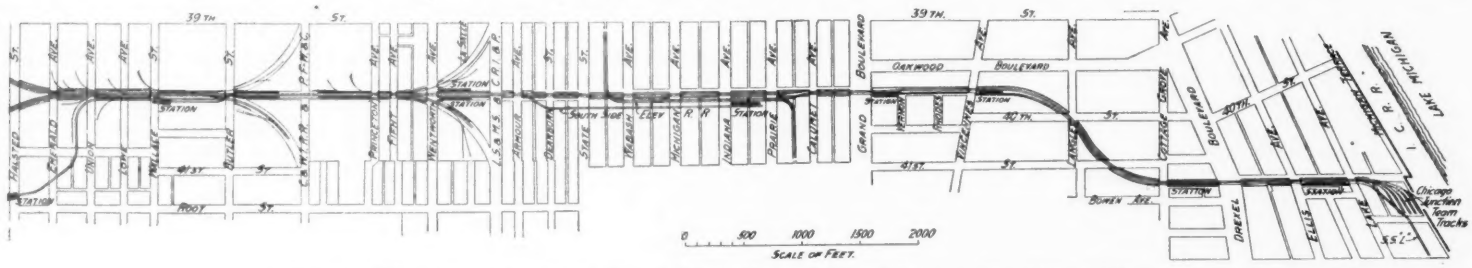


Fig. 1—Map of 40th Street Track Elevation Work; Chicago Junction Railway.

The accompanying map, Fig. 1, shows the extent of the track elevation work, which ends on the west with a run-off starting east of Union avenue. Work was begun in April, 1905, at the east end. As the map shows, besides the Illinois Central connection, the Chicago Junction has some team tracks at this point, which lie at right angles to the general direction of the line. The grade of the north track, used by the Junction, descends gradually from Drexel boulevard, while that of the other two rises from Ellis avenue to enable the elevated railroad's tracks to acquire the requisite head room over the tracks at grade east of Lake avenue. From this avenue eastward the elevated road built its own line on a steel structure. It turns southward to a station on 42d street and Oakenwald avenue, a block further south than the map shows. Adjacent to the station is an elevated yard of several tracks.

The Chicago Junction had a double-track line from the lake to Wentworth avenue before elevation work began, four tracks from Wentworth to Butler, and six from Butler to the stock yards. As already mentioned, the elevation work started at the east end. The south retaining wall of the section east of State street was built first, the adjacent track being used as a construction track and traffic carried on the other. When the south wall was done, a trestle was built to west of Langley avenue and traffic thrown on this while building the north wall from the northerly track, still at grade. From Langley avenue to Grand boulevard there was more room and the line from the trestle was run off on to a partial fill. The north track also was raised by filling as the work advanced, though kept at a lower lever than the operating track. From Grand boulevard to State street the north 26-ft. of the right-of-way had to be given up to the city for a street, under the terms of the ordinance. While this stretch of the north wall was being built the operating track was run outside of same, as the space between walls was too narrow to accommodate the construction and operating tracks conveniently.

The line formerly crossed under the Lake Shore and the Rock Island tracks, already elevated. With the new work the Chicago Junction agreed to go over these two roads. Passing under the South Side Elevated east of State street it rises on a 1.3 per cent. grade to a maximum of 41 ft. above city datum above the two roads mentioned, which depressed their tracks slightly to give an 18-ft. net clearance under the Junction's bridge. From this point the Junction runs down on a 1.33 per cent. grade to an under crossing of the P. F. W. & C. and the Western Indiana. This formerly was a grade crossing, but the grades were separated, the north-and-south roads going overhead, while the Junction raised only about 2 ft. to secure the gradient above mentioned. The grade ascends again to an over crossing of Butler and Wallace streets and Union avenue, the run-off starting a short distance east of the latter, as already mentioned, and extending west of Halsted street.

All masonry work is gravel concrete, the retaining walls being an equivalent 1:3:6 mixture, and the copings and bridge seats 1:2:4. The walls averaged a foundation depth of 6 ft., but where there was a possibility of the walls being in proximity to future large buildings, especially where the soil was mostly sand, safety was assured by going down 10 ft. Piles were used only at two points. The abutments of the Lake Shore-Rock Island crossing are so founded, due to the height of same, the soil conditions and the length of the bridge span. Also, where the elevated railroad structure crosses over the P. F. W. & C. and C. & W. I. the poor bottom and the length of span—230 ft—necessitated piling.

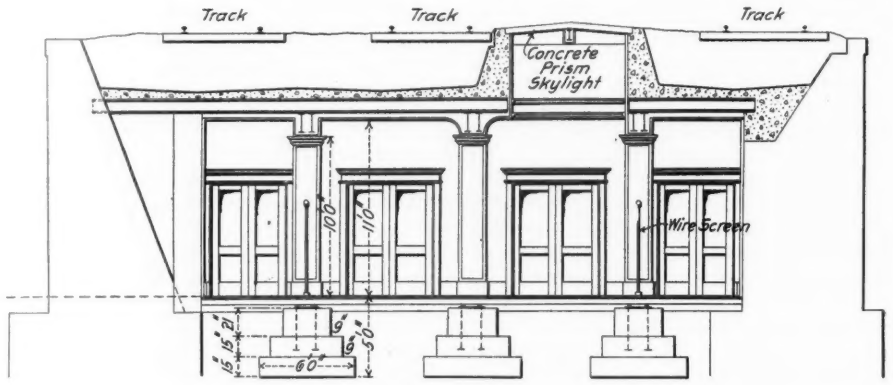
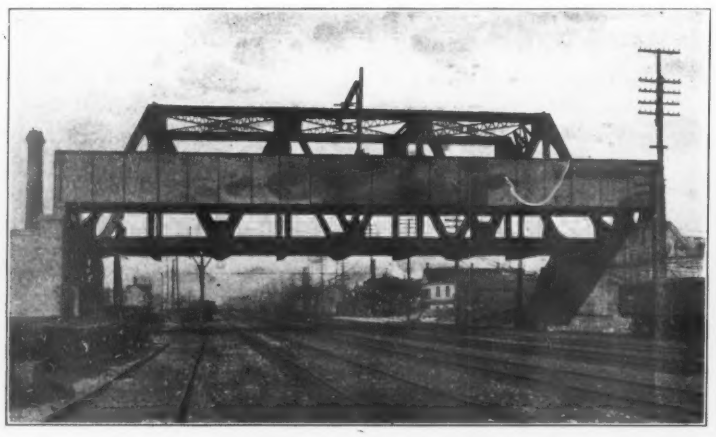


Fig. 2—Cross Section Showing Details of Entrance.

It has already been mentioned that the western extension of the South Side Elevated is built above the Chicago Junction for a part of the distance. As the map (Fig. 1) shows, this is between Armour and Union avenues. The steel structure is carried on the retaining walls, which are widened, or buttressed, at the top, wherever the steel columns occur, to furnish the requisite bearing area for the latter. The load is not sufficient to require any increase in the base dimension of the wall.

An interesting detail of the north wall as far west as Dearborn street is a conduit for telephone, telegraph, signal and electric light wires. It is a four-duct conduit embedded in the wall 12 in. below the top, with openings at intervals of about 300 ft., which are 12 in. wide, 24 in. deep and 48 in. long at intervals, as shown in the



Chicago Junction Railway and Elevated Railroad Bridges Over Lake Shore and Rock Island Tracks.

Elevated Station in Stock Yards; Chicago Junction.

Drexel Boulevard Crossing, Kenwood Line; Chicago Junction Track Elevation.

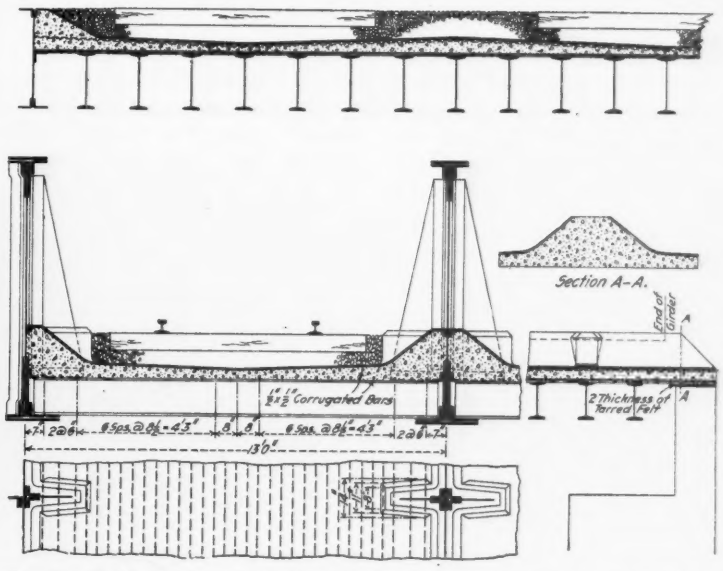


Fig. 3—Bridge Floor Details; Chicago Junction Track Elevation.

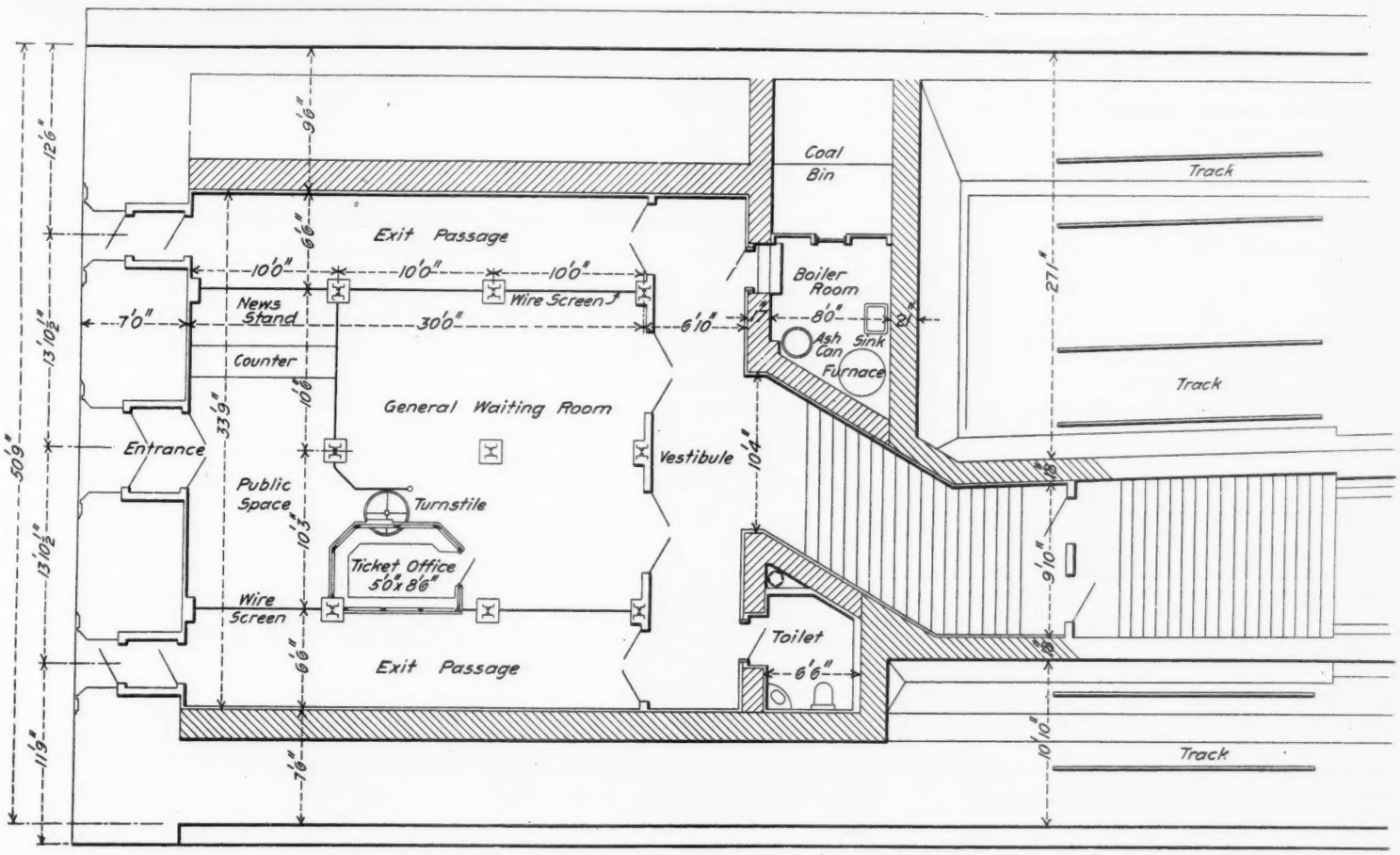


Fig. 4—Details of Typical Elevated Railroad Station; Chicago Junction Railway.

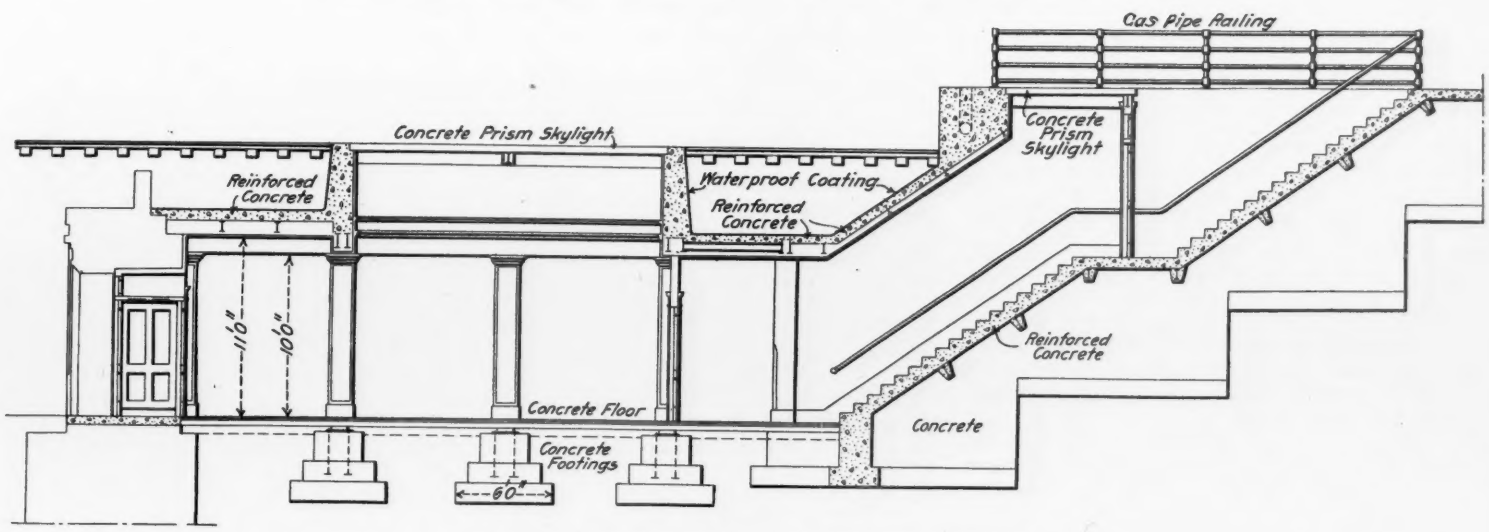


Fig. 5—Longitudinal Section Through Approach.

drawing. The openings have a wrought iron band around the top anchored into the concrete by four short rods bent downward, and are closed with a malleable iron cover.

Details of the longer span bridge floors are shown in Fig. 3. For the alleys and narrow streets the I-beams run longitudinally and girders are not used. The floors are the same for both kinds. The concrete slabs, which are a 1:2:4 gravel mixture, are reinforced with ½-in. corrugated steel bars. The slabs are waterproofed on the horizontal portion with "Medusa" compound contained on a 1-in. sidewalk-finish top coat, overlaid with a ½-in. coat of gum asphalt and above this 1 in. of asphalt mastic. In the inclined side sections, where a trowel finish could not be applied on account of the forms, the "Medusa" compound was put in the body concrete. The small triangular-shaped trough next to the girders is filled with gum asphalt. At the overlap of slab and abutment two thicknesses of tarred felt are placed. Four of the bridges are exception to this form of construction, limited clearance preventing the use of the concrete slabs. In these instances metal plates are laid directly on the I-beams.

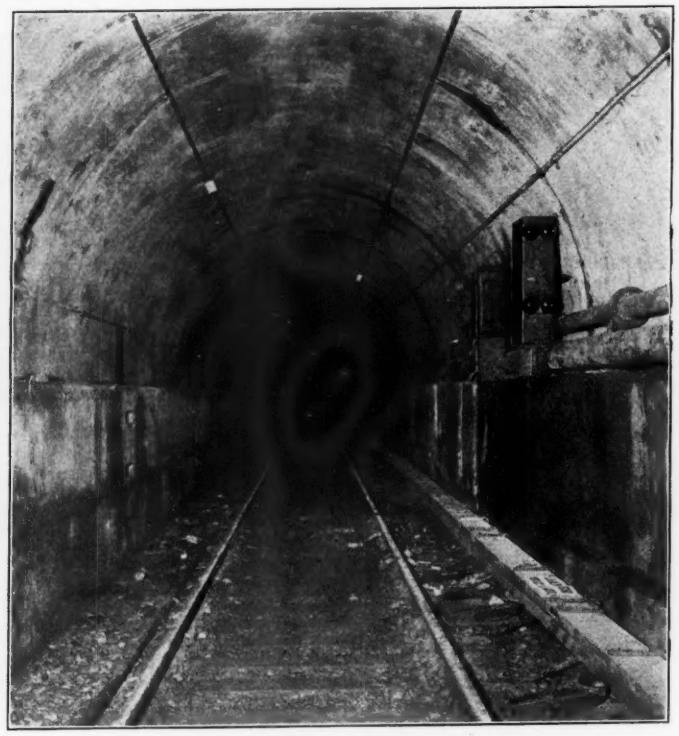
The stations for the elevated railroad on the Kenwood extension are a feature of special interest. Details of a typical station are shown in Fig. 4. They are at the street level and are of fireproof construction throughout. Entrance and exits are through the abutment, the face of which is bush-hammered, presenting a good appearance. The station interiors are roomy, well-lighted and well-arranged. The train platforms are concrete and the roofs are the usual umbrella type, with steel framework and transite board roof covering. The stations between Lake and Ellis avenues and between Drexel boulevard and Cottage Grove avenue have entrances from both streets. All subways are lighted by the railroad company, the power being furnished by the station at the stock yards. The wall conduit already described is used east of Dearborn street.

The Kenwood line has been in service for about two months. It is expected to have the work west of State street ready by the first of the year or shortly thereafter. All of the concrete work, street paving, sidewalk and sewer work was done by James O. Heyworth, Contractor, Chicago. The steel work for the elevated railroad, including erection, is being done by the American Bridge Company. W. M. Hughes, Consulting Engineer, Chicago, designed all of the steel work, which included the subway bridges and the elevated railroad structure. The filling and tracklaying are being done by company forces. The work was designed and executed under the direction of J. B. Cox, until recently Chief Engineer of the road. O. F. Cole, who as Principal Assistant Engineer was in active charge of the work, succeeded Mr. Cox as Chief Engineer and now has entire supervision of the work.

The Hudson & Manhattan Tunnels.

The first of the Hudson & Manhattan Railroad tunnels under the Hudson river will be opened to the public on February 25. This section consists of a twin tube tunnel from Hoboken, N. J., to Morton street, New York, and thence northeasterly to Sixth avenue and Nineteenth street, nearly three miles in all. The accompanying map shows the entire system, which has direct connection with the principal transportation lines on both sides of the river. The first section comprises the north tunnels, which are about to be opened. The second section, the south tunnels, is to be opened next September. They run from Cortlandt and Fulton streets, New York, to Jersey City, where a large terminal station has been built in solid rock directly beneath the present Pennsylvania Railroad station. The third section is a tunnel, 1¼ miles long, connecting the terminal in Jersey City with that in Hoboken. The principal point on this line is the Erie terminal, where the tunnel station is nearer the train shed than the entrance to the Erie ferry itself is. The fourth section is a branch line running from Jersey City to Newark. This runs underground through Jersey City and then comes to the surface near the Summit avenue station, from which point the trains will run over the Pennsylvania tracks to Newark. Another branch is now being built in Manhattan. It runs from Sixth avenue east under Ninth street and will connect with the Interborough Rapid Transit subway near Astor place.

The project of building a tunnel under the Hudson river for handling local passenger traffic between New Jersey and New York City dates back to 1878, when D. C. Haskins, a civil engineer, planned a brick tunnel from Hoboken to New York. Trains were to be operated by steam and the New York terminal was to be in the vicinity of Washington Square. A company was formed which spent a good deal of money and built about 1,200 ft. of tunnel. This company failed and in 1880 the undertaking was temporarily abandoned. Ten years later another company was organized with English capital, and S. Pearson & Son, the firm which is now building the East river section of the Pennsylvania tunnels, resumed work where the Haskins company had left it. This company added about 1,800 ft. to the part already built, and then also failed. These early attempts were marked by several accidents. The tunnel was



Interior of Tube; Hudson & Manhattan.

finally allowed to fill with water. In 1899 the property was sold at a receiver's sale and in 1902 it was taken over by the New York & Jersey, organized by William McAdoo. The Hudson & Manhattan was incorporated the next year to build the south tunnels and the former company and other subsidiaries have since been merged with it. The Hudson Companies is a construction company. The old tunnel was completed as one of the north tubes, of which the westbound tube was driven through in March, 1904, and the eastbound some months later. Work on the south tunnels was begun in the summer of 1905, and both of these tubes have now been driven from the New Jersey side to about the pier-head line at New York. The

Station Platform; Hudson & Manhattan.

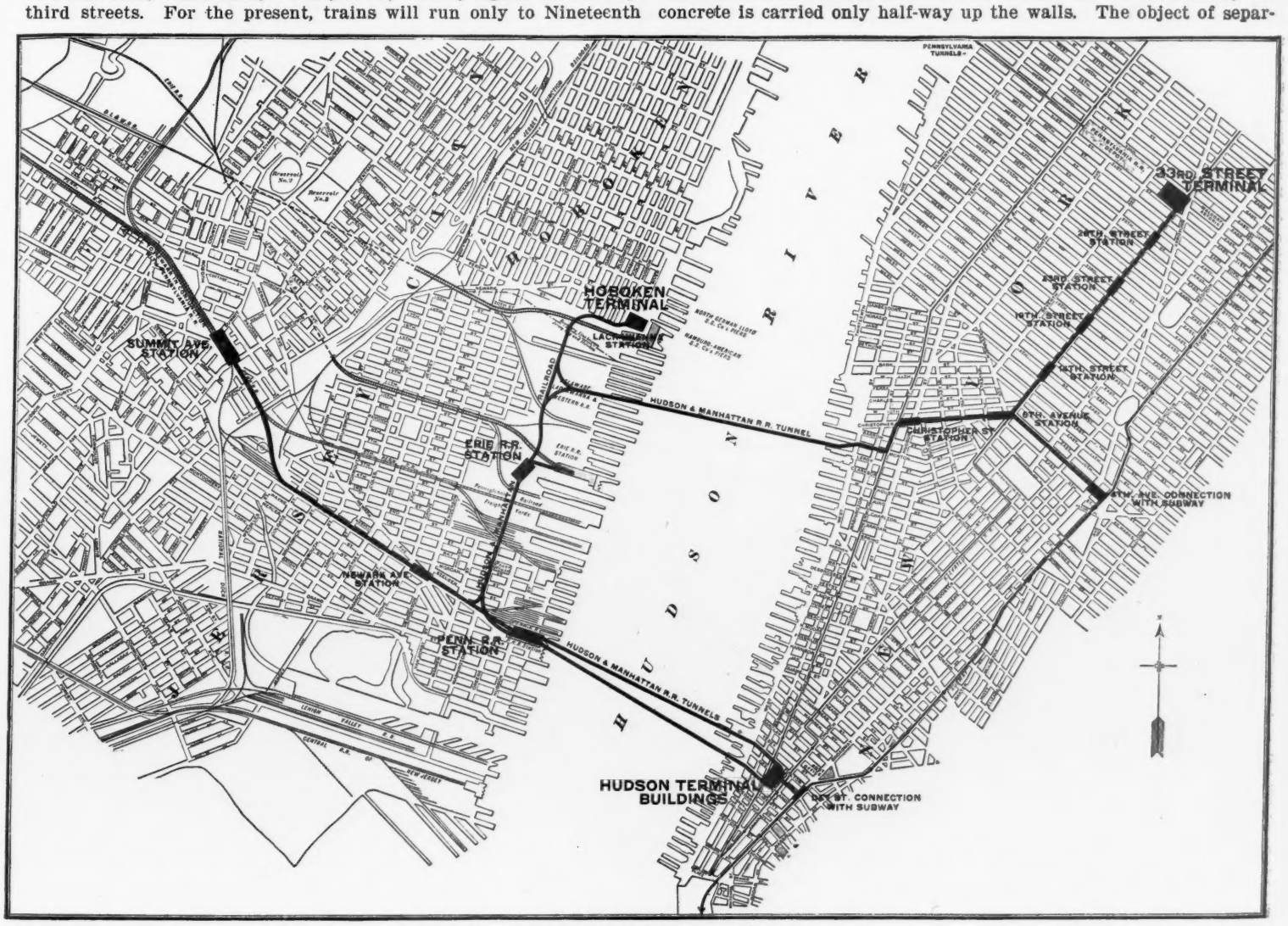
entire system, nearly nine miles, is to be double-track and will be put in operation during the coming summer. The cost is estimated at $70,000,000.

There will be no rail connection with other lines except, as mentioned above, at the Summit avenue station. Passenger stations in Manhattan, on the line about to be opened, will be located as follows: Christopher and Greenwich streets, connecting with the Ninth avenue elevated; Christopher street and Sixth avenue, connecting with the Sixth avenue elevated; and, in Sixth avenue, at Fourteenth, Nineteenth, Twenty-third, Twenty-eighth and Thirty-third streets. For the present, trains will run only to Nineteenth street and Sixth avenue. At the Hoboken terminal, connection is made with the Delaware, Lackawanna & Western, where all through and local passengers coming in from the west may get out of the trains and descend directly to the tunnel cars without leaving the station. The first section is to be operated by eight-car trains, and the time between Hoboken and Nineteenth street, New York, will be about 10 minutes. The cars were described in the *Railroad Gazette* of June 14, 1907.

View Near Hoboken Terminal; Hudson & Manhattan.

The platforms are so arranged at the terminal stations that passengers enter and leave the cars at the same time; those leaving go out on one side and those entering come in on the opposite side. This, it is hoped, will do away with much of the congestion which occurs at terminal stations on other lines. The tracks at all station platforms are on a tangent, so that there is no dangerous space between the cars and the platform, as is the case where stations are built on a curve.

The stations are intended to be large enough to accommodate present traffic and provide room for increased crowds if improved train service later gives the tunnels more carrying capacity. Every part of the stations is of either concrete or metal. One of the accompanying photographs shows the interior of a station. A noticeable difference between the appearance of these stations and those of the Interborough Rapid Transit subway is that in the former there is a curtain wall between the tracks at all points, except where there are crossovers, as shown in the photograph taken near the Lackawanna terminal. This view shows the form of construction of the tunnels under city streets in part of Hoboken and Jersey City and under Sixth avenue in New York. Most of the line, however, is tube construction. A typical view of this is shown in another photograph. The tubes are entirely lined with concrete except in the under-river sections and on certain curves. In these cases, the concrete is carried only half-way up the walls. The object of separ-



The Hudson & Manhattan Tunnels.

ating the tracks by curtain walls in the sections where they do not run in tubes is to secure natural ventilation due to the movement of trains. A system of power ventilation has also been installed.

The interior diameter of the tubes is 15 ft. 3 in. Under the river the rails are from 60 ft. to 90 ft. below the surface of the water. The depth of earth and rock between the roof of the tunnel and the water ranges from 15 ft. to 40 ft., the deepest part of the river being on the New York side. The two tubes are about 30 ft. apart for the greater part of the distance under the river.

The down town New York terminal is to be under the Hudson Terminal buildings at Church and Cortlandt streets. These structures occupy the larger part of two city blocks and are 22 stories high. They will accommodate 10,000 office tenants and will be opened on May 1. They contain more than 25 acres of floor space. One building is on Cortlandt street and one on Fulton street. They are separated by Dey street and are connected by a bridge at the third story. The tunnels come from under the Hudson river and under the terminal buildings about 30 ft. below the street level, forming a loop. The train platforms are two stories below the street level. A foot passage runs under Dey street to a station on the Interborough subway under Broadway.

It has been estimated that 75 per cent. of the passenger traffic now carried between New York City and the New Jersey side of the river by ferries will be diverted to the tunnels when they are all in operation. The numbers of passengers carried in the last three years by three of the largest ferries are as follows:

	1907.	1906.	1905.
Pennsylvania	43,406,750	37,745,012	32,829,182
Erie	19,718,465	18,796,871	17,321,759
Lackawanna	46,389,825	40,252,022	34,986,798

The officers who have been in charge of the building of the tunnels are: Walter G. Oakman, President of the Hudson Companies; William G. McAdoo, President of the Hudson & Manhattan; Pliny Fisk and William M. Barnum, of the banking firm of Harvey Fisk & Sons; Charles M. Jacobs, Chief Engineer, and J. Vipond Davies, Deputy Chief Engineer.

Increasing the Capacity of Brooklyn Bridge.

Improvements looking to a considerable increase in the traffic capacity of Brooklyn Bridge, with especial relation to the Manhattan terminal, are now underway and an important part of the work covered by the plans in their entirety—the extension of the bridge approach over Park Row—has been completed and is now in operation. The plans for adapting the bridge to its part of the service required as a section of the loop now being built, which is designed to form a close connection between the boroughs of Manhattan and Brooklyn, are now being carried out. This improvement involves principally the widening of the Manhattan approach so as to afford room for team traffic to the outside of the space now utilized for that purpose, which latter will be occupied by tracks connecting with the loop subway near Park Row and Centre street.

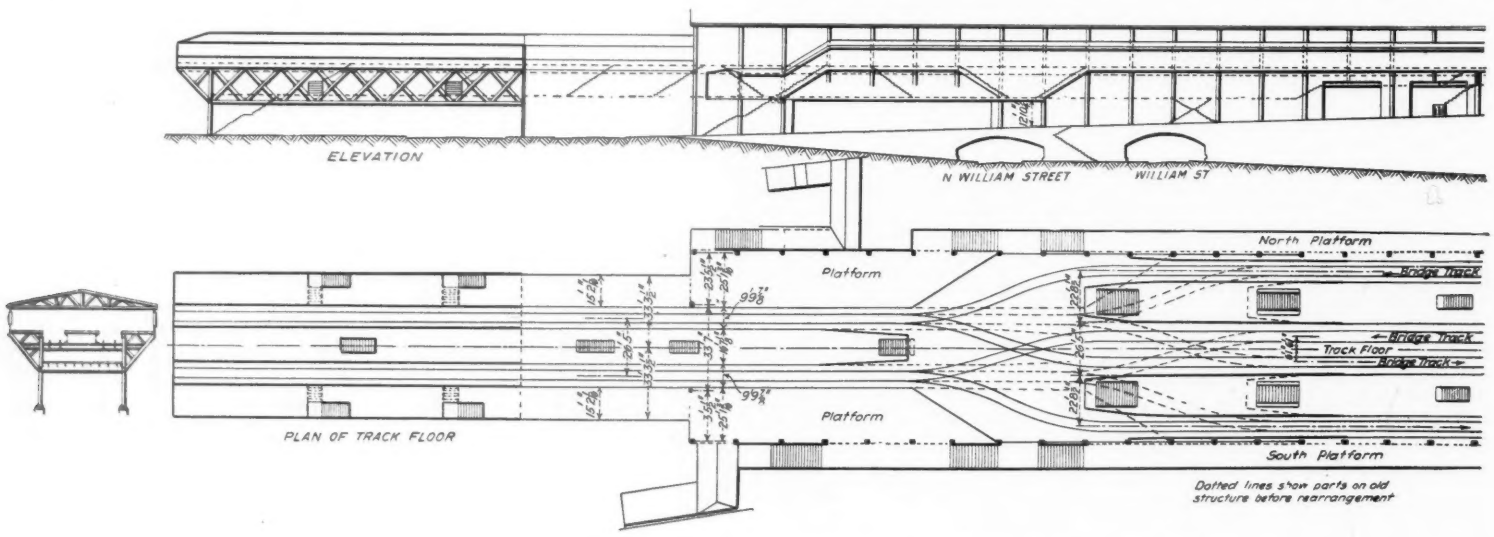
The object of the widening and its general character will appear clearly from an examination of the accompanying engravings. From North William street to Pearl street the bridge approach is being widened to the building line on each side by the erection of steel structures supported from the ground upon columns and attached to the existing stone masonry of the approach. These additions are of a general width of about 20 ft. on each side as far as Cliff street, at which point the widening is tapered off, so that at Pearl street the outer limit of the new structure ends on a line with the present approach.

How the connection will be formed between the subway level and the level of the bridge tracks is shown upon the plan and elevation of the bridge approach. The tracks will be brought up on a gradual incline from Park Row and Centre street, so as to reach the present bridge level at or near Cliff street. This will involve cutting through the upper part of the various warehouses now occupying the space underneath the arches of the bridge approach. At the extreme Manhattan end, in order to avoid interference with other bridge traffic, the tracks leading from the subway will be carried at the outer edge of the approach structure. Hence the necessity of the widening to afford teaming space. Beyond Cliff street, when the incline has reached the present bridge track level, the tracks will

Widening of Manhattan Approach.

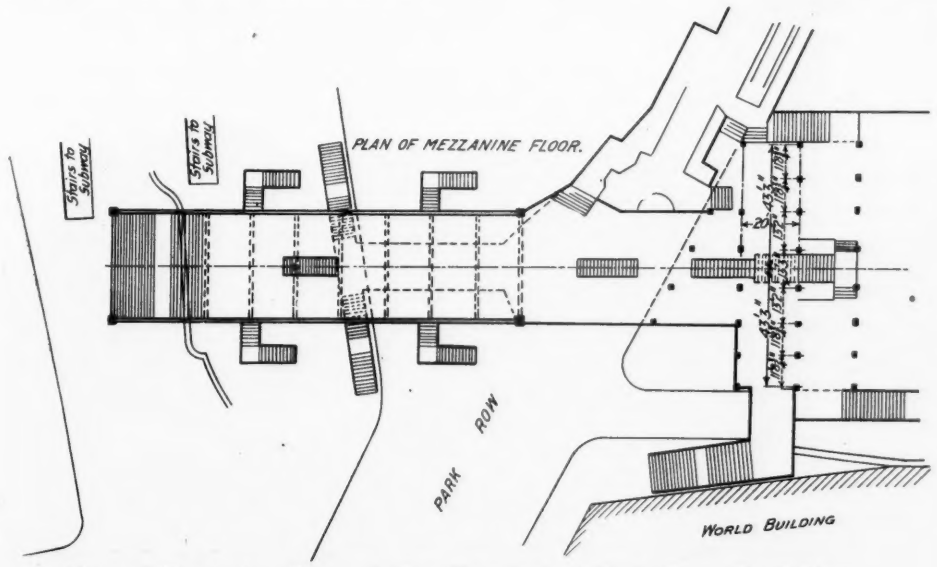
be brought closer together, as shown upon the plan, and occupy the space now used by bridge trains.

On account of the nature of the location and the close quarters within which the work is confined, the character of the structure forming the lateral extensions varies somewhat in detail. Typical bents, however, are composed of girders made up of web plates 38½ in. by 7/16 in., four angles each 5 by 5 by ⅝ in., a top flange 16 in. by ½ in., and a bottom flange 12 in. by ⅝ in. These are supported upon built-up columns. The floor beams are generally 20-in. I-beams of a 65-lb. section, and these are supported by three rows



Elevation, Section and Plan of Track Floor; New Manhattan Terminal of the Brooklyn Bridge.

of tie-rods 1 in. in diameter upset at the ends to 1⅜ in. It is required that all outside fascia girders be exactly 40 in. deep from the top of the top cover plate to the bottom of the first cover plate of the bottom flange. The floor beams vary in spacing on different sections in order to equalize spacing between block limits, but it is ordinarily 4 ft. 2 in. or 4 ft. 3 in. The whole length of the steel structure is 642 ft. 6⅞ in. on the south side of the approach and approximately the same on the north.



Plan of Mezzanine Floor of New Terminal at Park Row, Manhattan.

Work upon the widening has progressed to the extent that most of the steel work is now in place. A general idea of the nature of the work may be gained from the photograph.

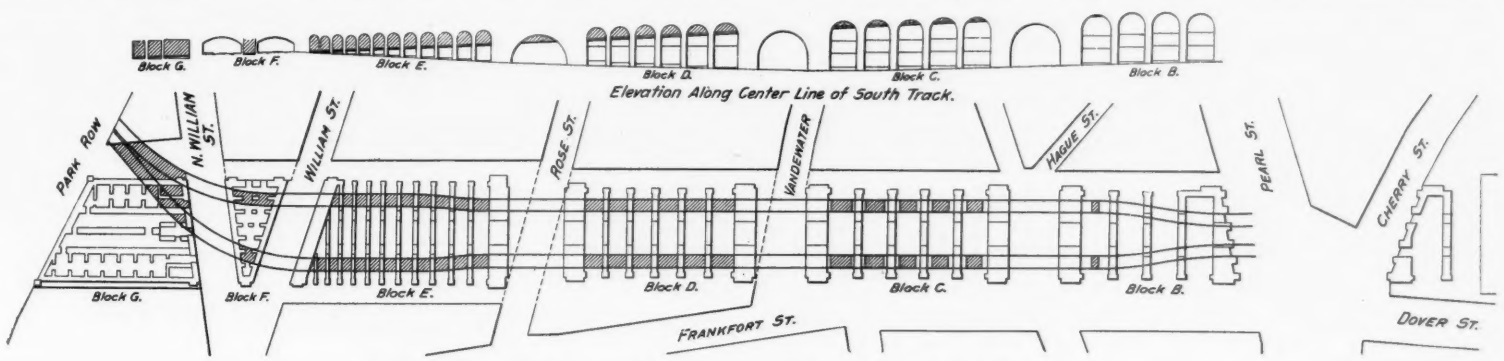
The improvements above described are entirely independent of those now about completed and which are involved in the extension of the elevated track floor of the bridge over Park Row. This was put into service on January 27. The difficulty which this temporary extension was designed to remedy was the lack of room at the Manhattan terminal to handle trains of sufficient length to care for the traffic in rush hours. Previously bridge cable trains of five cars each were run which involved a change at the Brooklyn terminal for all passengers destined for points on the elevated lines of the Brooklyn Rapid Transit—a very large percentage of the entire bridge travel.

On the date above named, six-car trains from the several Brooklyn elevated lines began running through to the Manhattan terminal without change at the Brooklyn end; and during the evening rush hours similar trains now run from the Park Row terminal to the terminals of the several lines in Brooklyn without change.

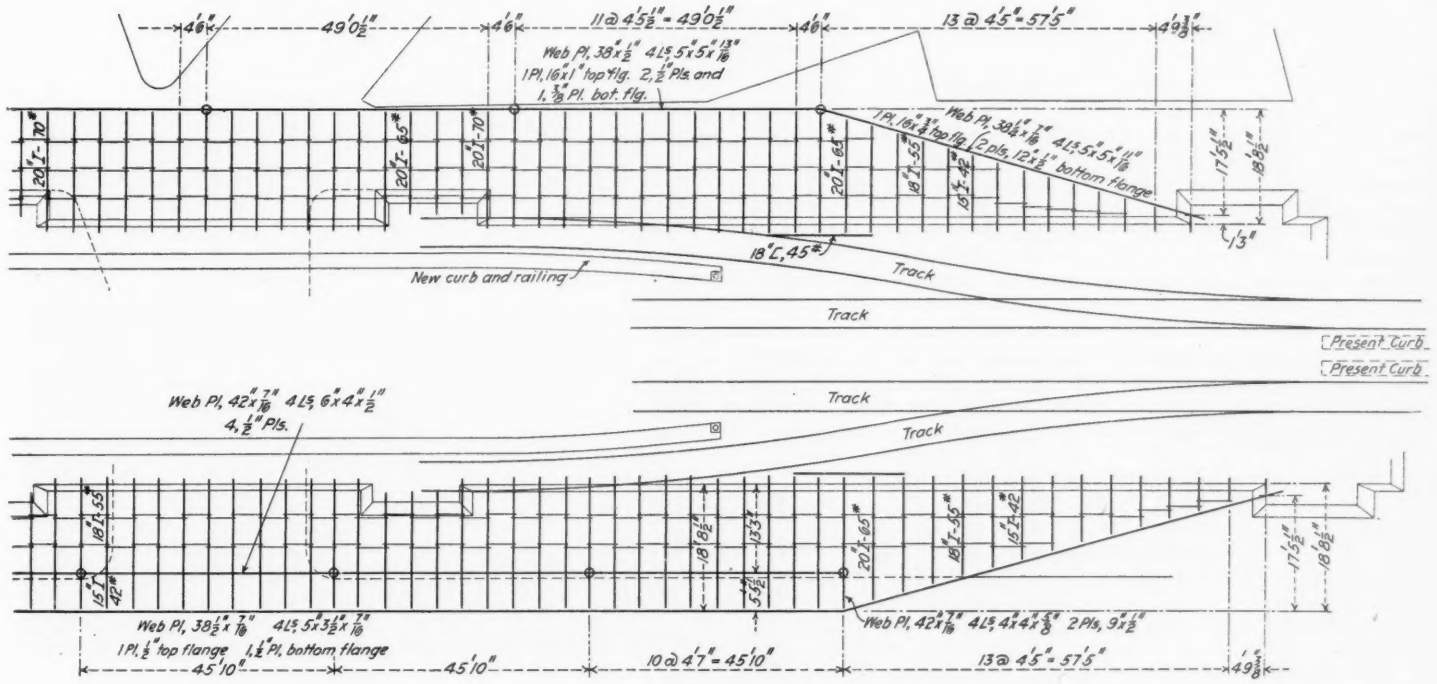
It is also expected to increase the bridge trolley service from 270 to 310 cars in the morning rush hours and from 300 to 320 cars in the evening rush hours.

The extension and the rearrangement of terminal facilities rendered possible by its completion are clearly shown in the engravings and one of the photographs. A steel structure 160 ft. long has been erected over Park Row, having a main floor on a level with the level of the previously existing elevated tracks, and with tracks extending to the end of the addition. The latter reaches almost to the line of fence of City Hall park and is directly opposite the entrances to and exits from the subway. It is architecturally in harmony with the previous structure and has a broad stairway, 40 ft. wide, leading to a mezzanine floor whence the crowd is distributed by five stairways leading to the train floor above and designated according to the destination of trains. Aside from the additional track room afforded, this whole amount of space is a substitute for the two stairways and narrow platform which formerly extended over Park Row. This is shown in dotted lines upon the engraving of the plan of the mezzanine floor.

With sufficient room for the extension of tracks to accommodate



Plan and Profile of Subway Connection Through Warehouses.



Plan of Brooklyn Bridge Improvement Showing Widened Roadways.

six-car trains, it has been possible to rearrange the cross-overs between inbound and outbound tracks. These were formerly at the point shown by the dotted lines, but have now been moved toward the end to the location shown in full lines. Under this arrangement about 340 ft. of free space for loading and unloading is afforded between the end of the tracks and the fouling points of the switches—ample room for six-car trains. This change of tracks also made necessary some changes in platforms—lengthening some and shortening others, as indicated in dotted lines upon the track plan—with, however, little change in the amount of available space.

It is estimated that the increase in loading and unloading facilities, the use of six-car trains and the avoidance of change at the Brooklyn end of the bridge, will increase its capacity about 9,000 passengers per hour. The two weeks during which the extension has been in service afford some ground for hope that bridge crushes of unsavory notoriety are things of the past—temporarily, at least. The first few days of service were marked, during the hours most favorable to congestion, by crushes perhaps equal to anything in the previous history of the bridge, but both by the engineers of the city bridge department and the officials of the operating tenant, the Brooklyn Rapid Transit Company, these were attributed to the lack of familiarity with the proper lines of passenger progression on the part of the public and of the company's employees. Since the first week, however, there has been no noticeable difficulty in handling traffic as fast as it presented itself, and even during that week 64 trains per hour were despatched from the Manhattan terminal. With the completion of the signal and interlocking arrangements it may be expected that trains will be handled regularly and smoothly under this or even less headway.

New Extension of Manhattan Terminal of Brooklyn Bridge.

It has, however, been suggested that a considerable improvement could be effected by increasing the door and gate space. It is calculated that in the absence of side doors and on account of the narrow gates upon the regular cars of the Brooklyn Rapid Transit Company, the entrance space is some 18 ft. less than upon the cable cars of which they take the place. This would be roughly equivalent to a stream of nine persons abreast. Even with the present equipment it is apparent that a great improvement has been made, though it is possible to attribute some of the decreased congestion upon the bridge to the relief afforded by the East river tunnels from the battery to Borough Hall.

Both of the improvements herein described were planned and executed, or are under execution by the city bridge department, C. M. Ingersoll, Chief Engineer. The extension and rearrangement of tracks was made in accordance with general plans accepted by the Brooklyn Rapid Transit Company. Though the work was accomplished under a daily traffic of 426,000 persons, it has been brought to completion with remarkable rapidity.

Foreign Railroad Notes.

The French Minister of Public Works has submitted to Parliament a bill for pensions to railroad employees, by which all employees who have served as long as two years will be entitled on reaching the age of 55 to a pension at the rate of 17 per cent. of their regular pay; and at the same rate if invalided at an earlier age. In case of the employee's death his widow is to be entitled to one-half of this pension. In case of death before 55, widow and orphans will have the same rights as if he were already enjoying a pension. This is to apply to employees of the railroad companies as well as to those of the small system of State Railroads.

The Prussian State Railroad authorities lay stress on providing trainmen, etc., with facilities for taking something hot to eat or drink when on duty during cold weather. One group of lines offers them powdered sweet chocolate, put up in packages each of which is enough for a large cup, which can be prepared very quickly with boiling water, kept ready for the men at a large proportion of all the stations. The prepared chocolate is sold to the men for $1.20 per 100 packages, which may be charged against wages.

To encourage traveling for winter sports, the Swiss railroads will accept those long snow-shoes which the Norwegians call "skis" and small toboggans as baggage; but not bob-sleighs (spelled out in just those letters as if the Swiss were Yankees), which are a little clumsy for baggage cars.

To show how much more important to France is the old Mont Cenis Tunnel than the new Simplon, the statistics of French traffic passing by the two routes in the first quarter of 1907 are cited, when 93,115 tons of freight went from France to Italy by the Mont Cenis and 3,336 by the Simplon.

Car Surpluses and Shortages, February 5.

The following table is from bulletin No. 17 of the American Railway Association's Committee on Car Efficiency. It summarizes the car surpluses and shortages from October 30, 1907, to February 5, 1908, inclusive, being similar to the table published in the *Railroad Gazette* of February 7, 1908, but carried to a latter date, and with the figures for January 8 and January 22, 1908, revised to include reports since received.

While the figures for February 5 represent fewer roads than those for January 22, the omitted roads are small and would make no material change in the totals. The total surplus of all cars on February 5 is larger than on January 22 because of some large increases in coal, gondola and flat cars.

Considering all classes of cars together, the surpluses have decreased slightly in the Eastern, Middle, Central Western and Southwestern groups. All the other groups show increased surpluses of cars, the highest percentage of increase appearing in the Southern group. The surplus of box cars has considerably decreased, showing an improvement in general business. The surplus of box cars decreased in the New England, Eastern, Middle, North Atlantic, Northwestern, Central Western and Southwestern groups, while the other groups reported slightly increased surpluses of box cars. Surpluses of coal and gondola cars show increases in all groups except the Northwestern, Central Western and Pacific. The heaviest increase was in the Eastern group. The increase in the Middle group, where the surplus of these cars has been heaviest, was slight, while there was a continued decrease in the Northwestern group and a slight indication of improvement in the Pacific group. The total surplus amounts to about 15 per cent. of the country's cars.

		Surpluses.					Shortages				
	Number roads.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Feb. 2, 1908	155	111,376	30,287	156,620	44,934	343,217	737	281	0	67	1,085
Jan. 22, 1908	161	124,622	27,328	142,338	48,292	342,580	392	132	79	135	738
Jan. 8, 1908	163	149,664	23,087	127,138	41,874	341,763	457	34	42	120	653
Dec. 24, 1907	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265	724
Dec. 11, 1907	153	48,977	9,888	27,462	33,012	119,339	2,506	420	746	848	4,520
Nov. 27, 1907	160	16,246	3,645	10,028	10,429	40,348	11,908	868	2,964	2,224	17,964
Nov. 13, 1907	164	4,103	1,208	2,365	4,525	12,201	37,473	3,066	10,914	5,550	57,003
Oct. 30, 1907	161	786	600	1,285	1,275	3,946	61,592	3,546	15,987	9,632	90,757

Raven's Cab Signal.*

BY J. PIGG.

Actuation of Apparatus.—As already stated, this system is electrical, and it is designed to collect indications by the rubbing of metallic brushes (Fig. 4) carried on the engine over metallic bars (Figs. 8 and 10) placed on the line. This method of collection is not essential to the system, since it is capable of being operated equally well without contact, by causing electromagnets on the line to influence magnets on the engine. This method of collection is not now being put forward.

Characters of Indications.—The system is one which uses visual and audible signals. The visual signals are (1) a small semaphore arm by which the "condition of line" signals are given, and (2) two small pointers showing 1—2 and 3—4 respectively, which are the route indicators. The audible signals, which are of the nature of "call attention" signals, are given by a bell. Besides these indicators, the instrument carried on the engine includes a visual failure indicator, by which the conditions of the apparatus can be gaged.

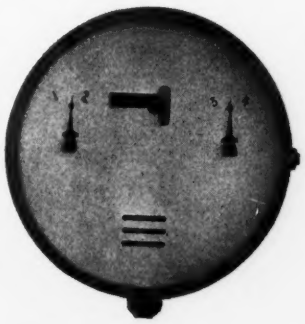


Fig. 1—Failure Indicator.

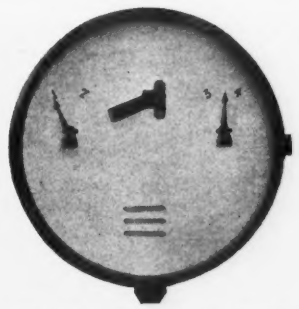


Fig. 3—Diverging Route Indicator.

Figs. 1 and 2 show several forms in which the indicator on the engine has been made, the circular form being the latest. Fig. 9 shows in diagrammatic form the complete equipment of engine and line circuits, the latter being for a 3-way diverging junction. Fig. 5 is a photograph of the back of the engine indicator with the cover removed to expose the apparatus.

Details of Indicator.—The action of the apparatus is of the simplest possible character, the main principle being the invariable operation of the apparatus at certain points by the natural action of certain parts without the aid of either the signalman or the driver, and the subsequent continuance of the indications resulting from the natural operations until they are stopped or reversed by the action of the signalman.

Considering Fig. 9, and leaving, for the present, consideration of the line of bars out of the center of the space between the running rails, it will be found that the short-circuiting of brushes 1 and 2 on, say, bar A, causes a current to pass through the main magnet, A^1, by which its armature is raised, putting the semaphore arm to danger. At the same time the armature closes the circuit of the springs *c d*, diverting the current direct back to the battery after passing through A^1. Hence the armature of the latter will remain attracted to the poles as long as may be necessary for the purposes of the apparatus.

Besides passing through A^1 and the brushes, the initial current passes through the bell relay C^1 during the continuance of the short-circuiting of the brushes 1 and 2; the armature is attracted and breaks the circuit through the spring contact (*e*). This contact forms part of the bell circuit, which itself is connected in shunt across the electromagnet A^1. Hence when the armature of A^1 is raised, the current from the engine battery tends to divide, part passing by A^1 and part by the bell. The connections, however, are such that current only passes to the bell when C^1 is unenergized, and this condition only obtains when the brushes 1 and 2 are not short-circuited. When the brushes are on a metallic bar, say A, therefore, the bell is silent, but as soon as they pass off the bars it commences to ring.

In addition to passing through the electromagnets A^1 and C^1, as described, the current to the brush 1 passes through the springs c^1 d^1, and c^2 d^2, each pair of which is normally in contact. These springs are opened by the raising of the armatures of D^1 and D^2 respectively. Opening the circuit at either c^1 d^1 of c^2 d^2 obviously releases the armature of A^1, and, as a consequence, stops the ringing of the bell and lowers the semaphore arm.

Currents passing through D^1 are collected from the line by the brush 2, currents passing through D^2 are collected from the line by one or the other of the brushes 3 and 4.

Between the poles of D^1 and D^2 are placed magnetized needles, n, n^1, pivoted to turn under the polarity of the poles when the electro-magnets are energized. The spindles carry the pointers shown in Fig. 1. Each spindle also carries a small metal sector, slotted as shown by Figs. 9 and 5, in which rides a small metallic loop, pivoted at the other end. The passage of a current through, say, D^1 deflects the needle to one side, and the loop drops into a recess at the end of the slot and locks the needle and pointer on the front of the instrument in the deflected position. At the same time that this occurs the lifting of the armature of D^1 breaks the contact c^1 d^1, and lowers the semaphore arm and stops the bell as already stated.

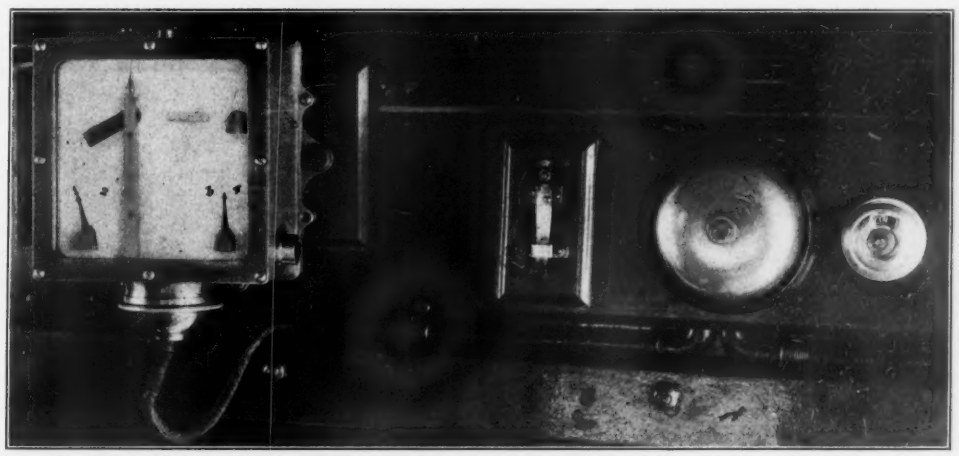


Fig. 2—Apparatus in Cab of Engine.

Auxiliary Apparatus on Engine.—The engine carries, in addition to the apparatus described, two rotary switches, the arrangement of which is shown in Fig. 6. Each switch consists of a cast-steel wheel free to rotate, the spindle of which carries a two-part commutator, on which bear two springs. The wheel is weighted so as to take up a normal position. In this position the springs bearing on the commutator are insulated from each other, but when the wheel is rotated they are connected through the commutator. The springs are connected with the brushes 1 and 2 respectively, and each rotary switch, when turned from its normal position, connects the brushes in the same way as the latter are connected when on the bar A, or any subsequent bar of those shown in Fig. 9.

Track Apparatus.—The rotary switches run over fixed bars on the line side of the general form shown on the diagram, and of which more detail is shown by Fig. 7. These bars are fixed in close proximity to the bar A, as shown by Fig. 8. Hence the rotary switches are only actuated at or near the bar A.

Turning now to the line equipment, the point represented as being approached is, as already stated, a three-way diverging junction. The six levers shown represent the home and advance signals for each of the diverging lines. Each home lever is fitted with a double-pole, and each advance lever with a single-pole switch, which are operated by the levers in the ordinary movement for operating

*From a paper read before the Institution of Electrical Engineers, London, December, 1907. The introductory part was given in the *Railroad Gazette* of Feb. 14.

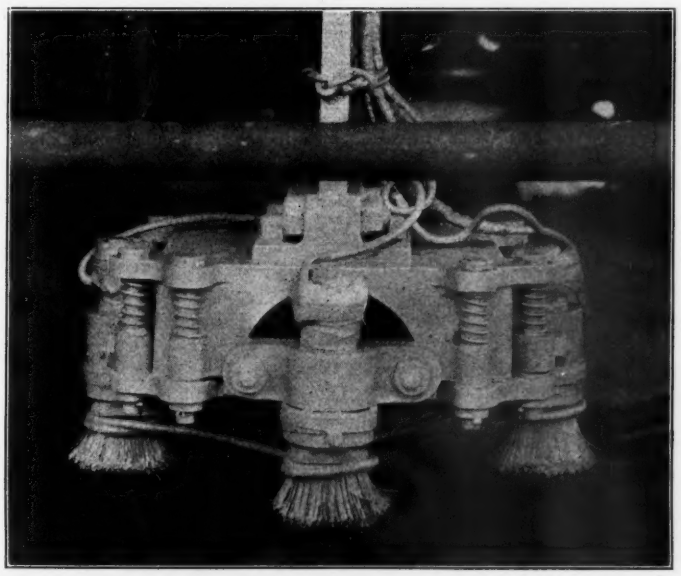


Fig. 4—Brushes.

the signals. The home and advance levers for the lines marked Nos. 1 and 2 connect the battery in the cabin with the bars B, C, D, E, placed in the center of the track, the only difference being that the levers marked 1 apply the positive pole of the battery to these bars, and the levers marked 2 apply the negative pole to the same bars. The two levers, No. 3, connect the battery in the cabin to the supplementary bars, and if the junction was a four-way one, other levers would reverse the polarity precisely as is done by levers No. 2.

As will be seen, the battery is not applied to the bars unless both the home and the advance signal levers are pulled over. The mechanical interlocking prevents the levers for more than one line being pulled over at once, or the home signal for one line and the advance for another, and therefore in the case under consideration there is no need for more than one battery.

A view of the bar A is shown in Fig. 8. It is mounted on wood blocks, which are in turn mounted on stoneware reels. The insulation is not high, as there is no need to aim at a high degree of insulation for this bar. Fig. 10 shows the arrangement for mounting the bars. It is necessary that these bars should be well insulated, and they are therefore mounted upon double-shed porcelain insulators of the ordinary telegraph pattern.

A further consideration of Fig. 9 will show that the preparations made for signaling to trains are indicated in the signal cabin. The two indicators required in the case of a three-way or four-way diverging junction are shown in Fig. 9. When the levers are pulled over, the current passes through a high resistance fixed at bar B, which limits the current passing before and after the engine reaches the signaling bars, but which, being in shunt with the engine circuits when signals are being given, does not affect the current to the comparatively low-resistance circuits of the engine. The resistance of the indicator is kept low with the same object. The permanent deflection of the indicator needle is comparatively small. When the signals are being given, the deflection is increased, and it can be used as an indicator to the signalman (1) of the position of the train which is approaching, and (2) whether the signals are being given on the engine.

Fig. 5—Circular Indicator. Rear View. Cover Removed.

Consecutive Operations.—Consider now in further detail what takes place in a typical instance. Assume that an engine is approaching the junction shown in Fig. 9, and that line No. 1 has been prepared for it to pass forward. The home and advance signal levers No. 1 are both in the off position, and the battery in the cabin is connected positive to line. All the bars, E, D, C and, B, are connected to the battery. Bar A is never connected to the battery, and is in no way under the signalman's control.

When brushes 1 and 2 are on bar A, the current from the engine battery passes through c^2 d^2, c^1 d^1, A^1, C^1, brush 1, brush 2, and to the battery. At practically the same instant, the same circuit is separately established by each of the rotary switches 5 and 6. The semaphore arm is put to danger, and as soon as the brushes are clear of the bar, the bell commences to ring. Ordinarily the time occupied in passing over the bar is from ⅓ to 1 second, so that the bell practically begins to ring simultaneously with the raising of the semaphore arm.

The visual and audible indications given at bar A continue until the brushes, or brush 2, comes into contact with the bar B. A current then passes from the bar B to brush 2, thence to the coils of D^1, and the engine frame, and the rails, etc., to the battery in the cabin. The armature a^1 of D^1 is raised and breaks the circuit through the springs c^1 d^1, lowering the semaphore arm and causing the bell to stop ringing. At the same time the polarized needle n is deflected so that its pointer indicates 1, and the wire loop drops into the depression and locks the pointer in the position it has taken up (Fig. 3).

The visual and audible signal given at bar A is a warning signal indicating locality with reference to the signaling point being approached: the reversal of the warning signal is the off signal. If the further passage of the train on its journey to the home signal be followed, it will be found that the bell will ring momentarily at the instant the engine passes over each of the bars C, D, E, but no change is made in the character of the visual indication.

The indicator now shows the off signal by the semaphore arm, and route 1 by the pointer. These indications continue until the next signaling point is reached, and are a reminder of the last signal received.

Assume that the engine has reached another bar A. The same actions take place as described for the previous signaling point, but, in addition to raising the semaphore arm, the electromagnet A, by the rod R (Fig. 9), raises the wire loop out of its recess and allows the pointer to assume its normal position. We assume again, also, that the road has been prepared for the train to pass forward, but, in this case, it is the right-hand road of a two-way diverging junction. On reaching the bar B, the same operations are carried out with the exception that No. 2 route is shown. It happens, however, say, that at the time the engine obtains the off signal, and route indication, 1,000 yards away from the cabin, the signalman is being informed of a circumstance which makes it imperative for him to stop the train if possible, and he instantly throws his home signal to danger, and immediately afterward the advance. The engine at the moment is just reaching bar C, say, and on passing on to it, the off signal shown by the semaphore arm is reversed and danger shown, the route indicator is displaced, and the bell commences to ring as soon as the engine is completely over the bar. These indications will continue as long as may be necessary.

These actions constitute the receipt of a warning signal, the off and route indications and an emergency signal, calculated to avert a disaster from circumstances which have suddenly arisen.

Assume now that another bar A, belonging to another signaling point, has been reached. Precisely the same effects are produced there as have been already described. The line, however, has not been prepared for the passage of the train. On arriving at bar B the bell stops ringing momentarily, but the semaphore arm remains

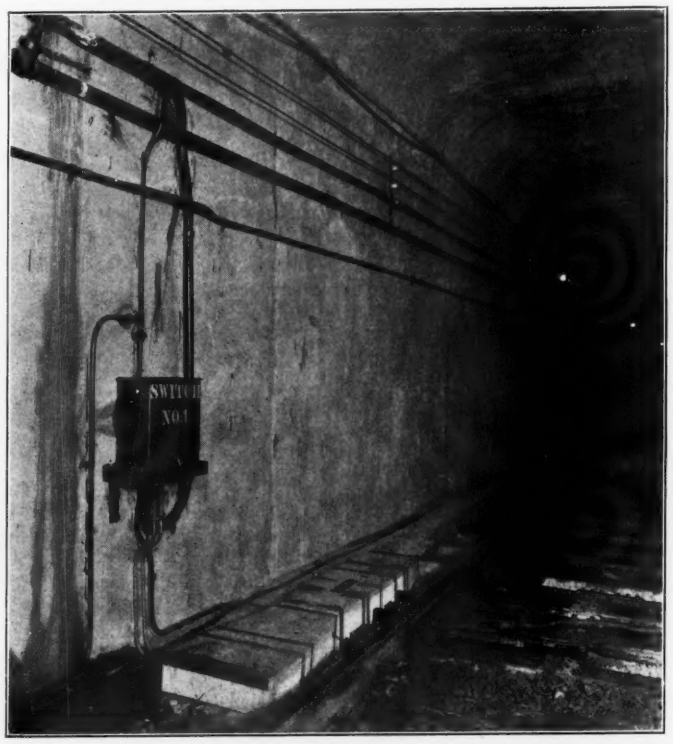


Fig. 5—Fire-Proof Fixtures at Switches.

at danger. Immediately the brushes have left the bar the bell recommences. The same effects are produced at bars C, D and E if no other signal is obtained at either of those points. The last bar is placed close to the home signal and is double the length of the other bars to allow of the train being brought to a stand easily with the brushes on the bar.

Hence the on signal is obtained by the continuance of the warning signal after the engine has passed over bar B, and that indication is continued until a subsequent indication is given by the signalman. The on signal, moreover, is of such a character, considered in view of the momentary stoppages of the bell by the intermediate bars, as to enable the driver to locate his position between the point at which he obtained the warning signal, and the home signal at which he must be prepared to stop.

Assume that as the engine approaches the bar D, the signalman lowers the home and advance signals. When the brushes come upon the bar the off signal and route indication will be received precisely as already explained.

Hence the on signal originally received at B may be reversed,

and an off signal may be obtained at points between B and the first stop signal just in the same way as the driver sees the line signal lowered before he reaches it in clear weather by the projection of his vision.

Making another assumption, suppose that the engine has been brought to a stand on bar E close to the home signal, and is waiting for the receipt of an off indication. The semaphore arm is at danger, but the bell is silent. The signalman lowers the home and advance line signals for the train to proceed. Immediately the semaphore arm on the engine is lowered, the route indication appears, and the bell commences to ring and continues to do so until the brushes have left the bar. Hence, the receipt of the off signal

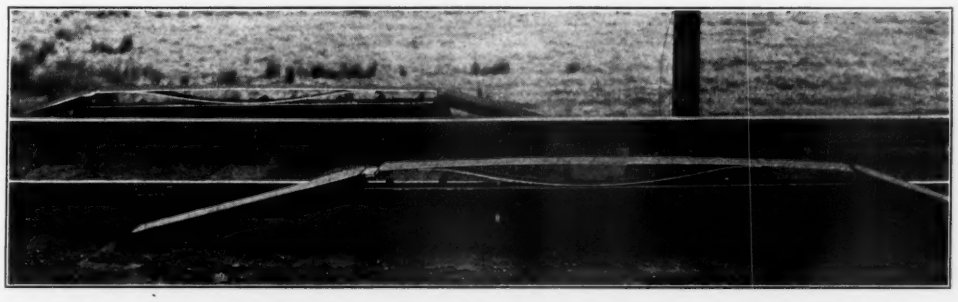


Fig. 7—Spring Bar and Ramp.

when standing at the home line signal is given, and the driver's attention is called to the change by the bell commencing and continuing to ring.

Suppose, now, that instead of sending the train straight away after bringing it to a stand at the home signal, the signalman wishes merely to call the train forward to communicate with the driver, or to bring the train forward to the advance signal, the signalman lowers the home signal and works the advance signal lever back and forward. The semaphore arm on the engine will be worked up and down and the bell will ring intermittently and call the driver's attention to the character of the indication given. Hence a cautionary or "calling on" signal can be given to trains standing at the home signal, and the indication is of a different character to other signals obtained in that position.

In the foregoing description the signals have been given for a two-way diverging junction, or for a straight road. Suppose a train traveling to the signaling point in Fig. 9, and that road No. 3 has been prepared for it. The brushes 3 and 4 are connected together so that either is available for the same purpose. As shown by the diagram, brush 4 will engage with the bars parallel to B, C, D and E. The warning signal is given by brushes 1 and 2 on A as before. On the arrival of the engine at B, the brush 4 takes the current from the bar, after which it passes through the coils D^2, deflecting the needle n^1 to 3, and by the raising of the armature breaks the contacts c^2 d^2. The wire loop drops into the recess at the end of the slot in the sector, and locks the route indicator in the position required. The net result is precisely the same as described for the route indications 1 and 2 with the exception that the first of another pair of such indications is given. Had the junction been a four-way one, the action of the levers for the signals for the fourth line would reverse the polarity of the bars, and the indication 4 would be obtained. The next operation of the electromagnet A frees the route indicators, 3—4, precisely as described for 1—2. The double brush, 3—4, is to enable signals to be obtained whether the engine is running engine or tender first, toward a three-way or four-way junction, and it is also used in connection with single line working to be described later.

Failure Indicator on Engine.—The means for testing the condition of the circuits and battery on the engine have not yet been referred to. The actual indicator is a small disc (Fig. 2) or a grid (Fig. 1) appearing at an opening in the front of the instrument, which is white when the engine battery is in operation, and red if the battery fails or is cut off. The failure indicator circuit is independent of the other apparatus. Current is taken to the coils of E^1 from one end of the battery, and thence to the brush 2, which completes the circuit. Interposed in this circuit are two small electromagnets, the poles of which embrace the polarized needles n n^1, and tend to preserve their magnetism. As the failure indicator is always in action when the engine is at work, there is a constant current available for this purpose. In carrying the "failure indicator" to brush 2, the insulated wire is wrapped around all four brushes as shown in Figs. 9 and 4. Hence any obstruction on the line which displaces the brushes will break the failure indicator circuit and bring it into action. The failure indicator magnet E^1 has a back contact, e^1, which is open when E^1 is energized, but is closed if the armature a^3 is released. This contact simply bridges the open springs, *c*, *d*, of A^1, and if the armature a^3 is released, through the breaking of the circuit of E^1, the semaphore arm rises to danger, the bell commences to ring, and the disc or grid (Fig. 1) shows red. When the battery fails the disc or grid shows red.

Single Line Working.—Fig. 11 shows the engine equipment available for single or double line working. It only differs from Fig. 9 in the addition of a small three-pole, three-way switch. It is unnecessary to describe this in detail, as the side references afford sufficient information to follow the connections. In the center position of the switch the apparatus is ready for double line working, engine or tender first. In the left-hand position it is available for single line working, engine first; and in the right-hand position for single line working, tender first.

The peculiarities of single line working require modifications of the track apparatus to obviate the receiving of signals on an engine proceeding in one direction, from the track apparatus provided for traffic proceeding in the opposite direction on the same pair of rails. A simple form of single line equipment is shown in Fig. 11, an examination of which will show that the bars A are double, but connected together electrically, and that only one spring bar for operating the rotary switches is provided near A, instead of two as in double line working. The additional bar connected to A is always on the left-hand side of the latter looking in the direction in which traffic passes for which the line signals are provided. Similarly the spring bars for the rotary switches are always on the left-hand side.

An examination of the switch circuits will also show that the operation of the switch to right or left always cuts out of use the right-hand rotary switch and the right-hand brush (3 or 4) looking in the direction in which the engine is traveling. It also puts out of action brush 1. Hence only the left-hand rotary switch and the left hand brush (3 or 4, according to whether the engine is running engine first or tender first) are operative, and while the right-hand rotary will be turned by the spring bars for trains going in the other direction, the brush 1 will always bear upon the center bars, and the right-hand brush (3 or 4) will always bear on the right-hand bars, their usual functions are in abeyance in consequence of the position of the switch. The warning signal is given by the short-circuiting of the brushes 2—3 (or 4) and the rotation of the left-hand rotary. The off signals are taken up by the brush 2 for the route indicators 1—2, and by the brush 3 (or 4) from supplementary bars for the route indicators 3—4. All other operations remain as described. Hence a simple movement of the switch to one side or the other, according as the engine is running engine or tender first, is all that is necessary in passing from double to single lines, or *vice versa*.

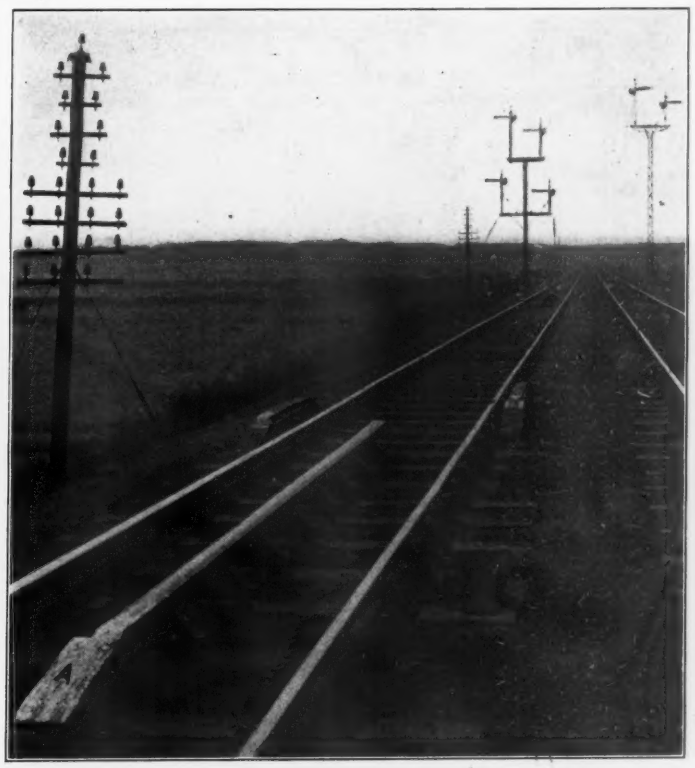


Fig. 8—Bar A.

Recording Indications Obtained.—The system lends itself readily to the adoption of means by which the "condition of line" signals obtained may be easily recorded for each signaling point. The length of time during which the semaphore arm is maintained at

danger differs in accordance with the condition of the line. If an off signal is obtained at B the time is short; if the on signal is received the time will be longer, and will depend upon the point at which the off signal is ultimately received. In any case the difference is appreciable. This difference may be utilized in order to produce marks of corresponding length upon a cylinder which rotates and travels longitudinally at the same time, by adding a marking pen or pencil to the rod *b* of A¹, so that a mark is made as long as the armature (*a*) is raised. The motion of the cylinder causes the marks to form a spiral. For places where the off signal is obtained at the bar B, the mark is a dot only. Where the on signal is obtained at B, the mark is a line of greater or less length according to the time that elapses before the off signal is obtained. The drum carrying the paper cylinder is driven by clockwork, and is under the control of the signaling apparatus, so that it is only running when marks are to be made, and the driving mechanism and the marking cylinder are therefore kept of quite moderate dimentions. Arrangements are made by which the driver can produce a space longer than that provided by the design of the apparatus, and so distinguish between the marks made during one journey and the next.

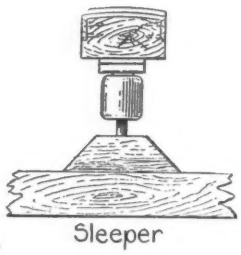


Fig. 10—Support of Insulated Bar.

CONCLUSION.

I.—(*a*) The natural action of the bar A, through the brushes, and that of the yielding bars upon the rotary switches upon the engine circuits constitute a signal, warning the driver of his approach to a signaling point, at which further indications must be looked for at once. (*b*) Neither the engine driver nor the signalman are required to do anything to produce this signal. (*c*) The indications being given from three independent points for double lines, and from two for single lines, provide ample marking for failures of apparatus from any cause outside ordinary maintenance of the battery. (*d*) The alternative method for producing this indication, and the difference in their positions on the engine and track, are guarantees that anything likely to affect one means prejudicially is not likely to affect the other.

II.—The continuance of the warning signal constitutes an effective danger "condition of line" signal, relating to the stop signals which are being approached. The bar A is situated at a distance of about 100 yds. from B. The warning signal proper is therefore of short continuance only if the stop signals are off. No time is lost in conveying the further indication on when the stop signals are in that position. The subsidiary indications, given by the

Fig. 9—Electrical Apparatus and Circuits for Raven's Cab Signal; North Eastern Railway.

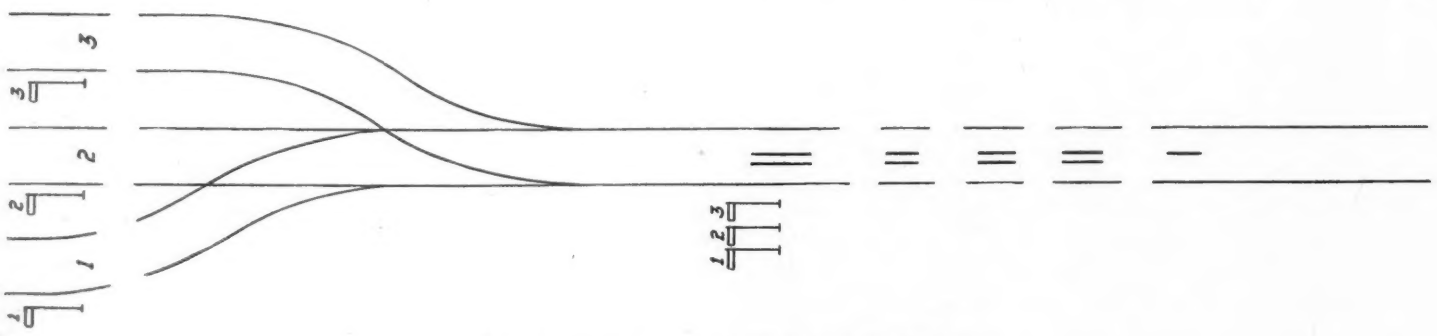


Fig. 9a—Tracks Drawn to a Smaller Scale.

momentary stoppages of the bell, are valuable for indicating the progress of the train toward the stop signal, when conditions of weather prevent the ordinary landmarks from being seen.

III.—The stopping of the warning signal by the return of the semaphore arm to the off position, the stopping of the bell, and the receipt of the route indication constitute a complete off or line clear signal, which, since it cannot be given unless both the stop signals controlling entrance to the next section are off, gives also the exact information now given by the lowering of the line distant signal. The convention under which the route indications are numbered is in strict accordance with the convention under which the line signals are erected. A straight through point is always signaled as 1.

IV.—Either "condition of line" indication received at bar B can be reversed before the engine reaches the stop signal. The number of intermediate points at which these reversals can be obtained is limited only by the number of intermediate bars provided. Additional bars are not costly.

V.—The off signal can be given when the train is standing at the home signal equally as well as when it is traveling, and attention is called to its being given by the audible signal. The signal given when the train is standing at the home signal can be modified by the signalman to indicate a calling on signal, or the equivalent of a flag signal, and this is totally distinct to the off or "line clear" signal.

VI.—Indications are provided in the cabin by which the signalman knows whether his apparatus is in order, and by which he can trace the progress of a train toward the home signal from the bar B, and note whether the signals appear to be given correctly.

VII.—The system, being electrical, admits of the signaling point —the bar B—being put at any distance from the cabin without affecting the efficiency. There is, therefore, no reason why it should be put at the point at which the line distant is now erected. Such signals are usually visible at some distance, and there is no reason why the bar B should not be set at this sighting distance. The increasing speed of trains makes it desirable that the signals given at B should be obtained as early as possible, to admit of easy braking when necessary.

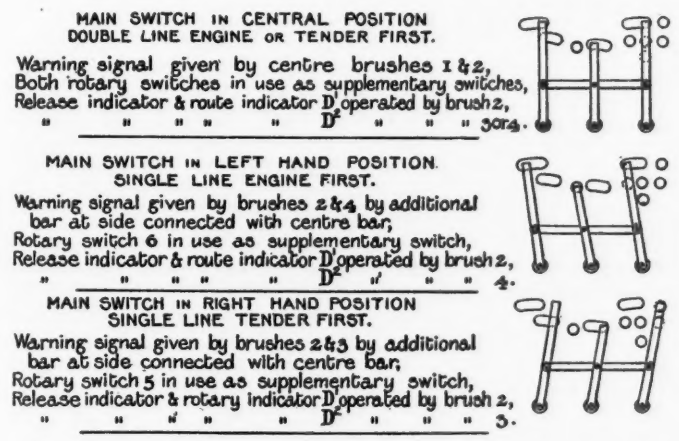
VIII.—The line distant signal plays no part in the working of the system, and may be dispensed with if desired.

IX.—A further examination of the system will show that failure of the apparatus on the line will not cause a false off signal to be given. Any failure of the battery in the cabin, or breakage of the line wire puts the bars B, C, D and E into exactly the same condition as A, which can only produce the danger indications. Contact of the line wire with telegraph wires on the same poles is not likely to give a false signal, as the apparatus on the engine requires stronger currents than are to be met with in telegraphy. Failure of the apparatus on the engine provides its own indications.

X. and XI.—* * * The system has been used two winters with no difficulty from ice. The brushes seem to clean the bars at every operation. If films of ice were to make trouble, a daily rubbing with an oiled rag would cure it. The insulation of the energized bars has been found more difficult than the maintenance of the contacts, but the double-shed insulator, now in use more than 18 months, has cured all troubles. * * * It will be seen that the system furnishes the maximum information with a minimum of apparatus. Shocks due to impact have been done away with. * * *

XII.—The system has now been in use experimentally on the North-Eastern Railway for nearly two years, on what is the fastest short-distance train in the world, and on other express passenger trains. No attempt has been made to develop it by trials on slow trains. Under the conditions of use, the apparatus is working perfectly. The directors of the North-Eastern have arranged for the equipment of 20 more of their express engines and of about 14 miles of their main line between Newcastle and Durham.

Dry cells have been found to give the best results on the engine, and have given perfectly good results in connection with the track



B The non-energised bars (warning signal bars)
C are double but electrically connected together
one bar is in the centre of the track and the other
on the left hand side looking in the direction trains
travel in accordance with signal.

Fig. 11—Raven's Cab Signal Circuits Arranged for Single-Track Operation.

circuits. Six cells are required on the engine, and twelve cells are used in the cabin for the track circuits. The wire for connecting the energized bars with the battery in the cabin is carried on the telegraph poles.

The Ocean Carrier.

BY J. RUSSELL SMITH, PH.D.

VII.

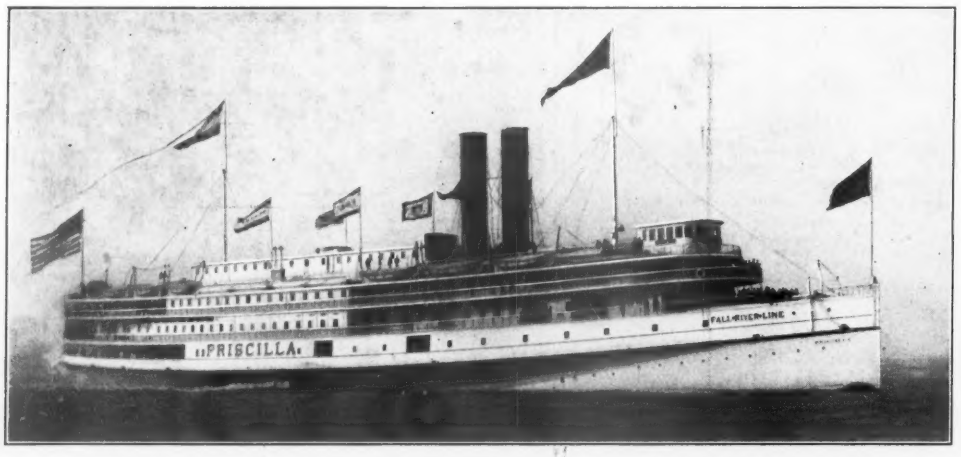
The Railroad Steamship Lines on the Atlantic and Gulf Coasts of the United States.

The previous article has pointed out the tendency of transportation companies to consolidate by both land and sea. There is no reason why the two systems of transportation should stay apart, and it is natural that this process of consolidation should overleap the land and demand the combination of both steamship and railroad lines to complete the requisite unity of service. The railroad line with steamship feeders would be benefited thereby and at the same time steamship lines with railroad alliances would be better served. There is a common want and a mutual advantage—each can help the other in its desired extension of service.

Extension of service does not necessarily mean consolidation of carriers. If it so happens that the desired service can be obtained without consolidation, the consolidation will probably not occur. The railroad that has its terminus in a port with great sea connections finds its wants supplied. Alliances there are unnecessary, and indeed they may be rather more entangling and limiting than beneficial, and are therefore to be avoided. New York, London and Liverpool are not the ports in which we can best study railroad steamship lines. The railroads that reach these ports have practically completed their world connections by reaching a point where these connections have been already established in response to the demands of existing local commerce. The number of ports with such satisfactory connections is small, and in most parts of the world the railroad that reaches the sea finds its wants unsatisfied if it depends upon such sea carriers as may independently seek freight at its terminus. The railroad must extend itself across the seas. It is thus manifest why the railroad steamship line is of a world-wide occurrence. It has its fullest development in America, but it exists also in the Irish, Baltic, Aegean, Yellow and Japan seas.

THE EXPERIENCE OF AMERICAN RAILROADS.

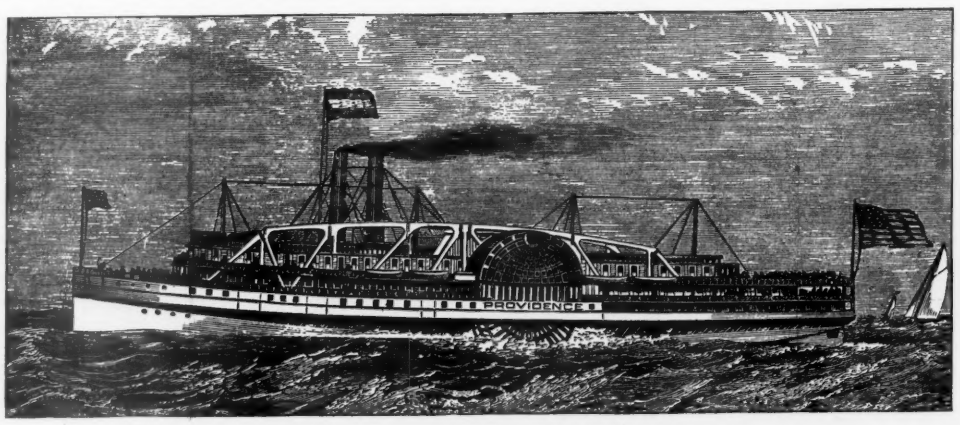
In its larger aspects, the railroad steamship line is coincident with the development of long railroad lines, but it had its American origin on Long Island sound in the early days of railroads in America. This partly enclosed body of water offering a somewhat sheltered route almost directly toward Boston from New York was admirably placed by nature for this combination service, which developed most naturally. The steamboats from New York to Norwich in 1818 connected there with the stage lines to Boston and other eastern points, and from that day to this there has been a varying but generally increased amount of co-operation between the two carriers, which has almost resulted in unanimity of ownership.



Steamer Priscilla (1894) Fall River Line; New York, New Haven & Hartford.

The first steamboat line from New York to Providence in 1822 was followed by another in 1827, and connecting stage lines carried the passengers on to Boston. In 1832 there were four of these stage lines, and they competed even more fiercely than the steamboat lines, and this competition was keen. This competition between the two groups of carriers promptly worked toward a consolidation of service upon the opening of the railroad from Boston to Providence June 15, 1835. Just at this time Cornelius Vanderbilt put a steamer on this route, and he met the competition of the older lines by having a special train take his passengers from Providence to Boston. The boats of the older lines left Providence for New York just after the arrival of the noon train from Boston.

This informal connection between the railroad and the steamboat did not survive, nor was the steamboat's dominance in the relationship to be permanent. Within two years (1837) the Rhode Island Legislature was calling the Boston & Providence Railroad to account for having violated its charter by refusing to some steamboats free access to its wharves for the discharge of through passengers and freight. This fruitless action resulted because the railroad had for some time been interested in some of the steamboats



Steamer Providence (1866) Fall River Line.

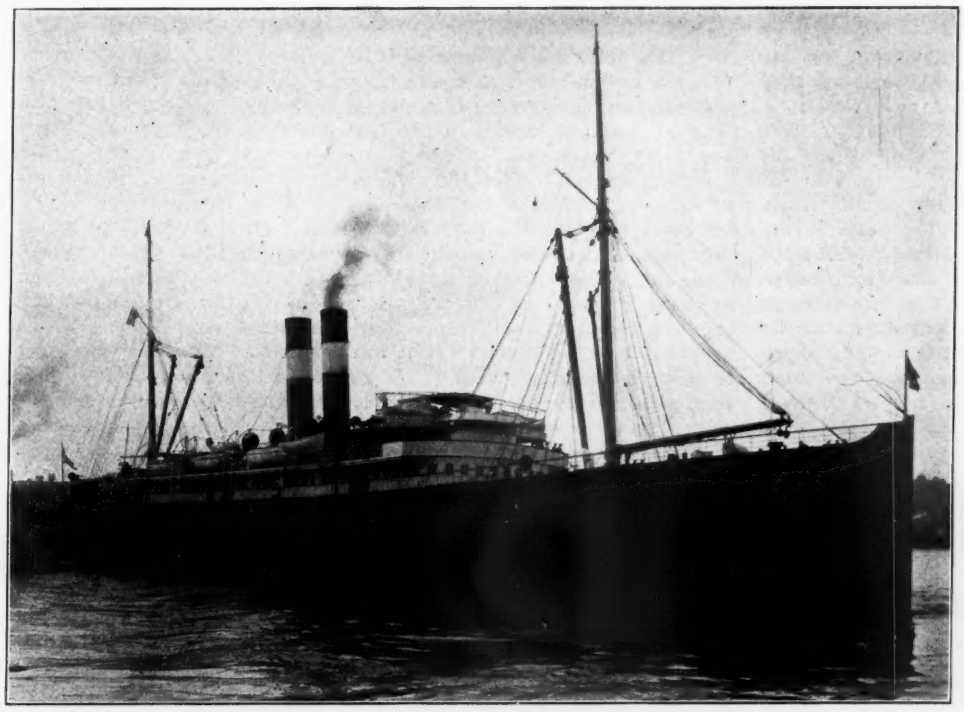
and took this means, though ineffectually, to break the opposition.

A railroad owned by another company was completed from Providence to Stonington late in the same year, and in the season of 1838 this company made agreements with Vanderbilt and other steamboat owners for a steamboat line connecting at that point for New York. Just at this juncture the Atlantic Steamboat Company, a new corporation, put on a very fast boat to Providence. The Boston & Providence Railroad Company at once put down the fare from Providence to New York to $2 direct and $3 via the quicker Stonington route. The boat of the new Atlantic company was too fast for them and the next step was to offer to purchase Vanderbilt's steamer for $60,000, provided she could beat the boat of the rival Atlantic Company. This she failed regularly to do so the fare by the railroad steamboat line came down to $1. Petty persecutions followed, no special trains would be granted to the passengers of the rival boat when she missed the regular train. But despite these efforts, the rivalry and races were stopped only by the railroad company's purchase of stock in the rival Atlantic Company and consequent strong representation on the board.

By 1845, upon the completion of the Norwich & Worcester Railroad, the Boston-New York traveler had the option of a third combined water and rail route, that via rail to Norwich, Conn., and thence by boat down the Thames and along the sound, but this did not give any severe competition with the Boston & Providence Company, which was the strong member of the group.

The years 1844-46 were years of active competition with three or four independent steamboat lines running between New York and the Long Island sound terminus of the Boston roads. In 1845 Vanderbilt, Drew and others got possession of the Providence & Stonington Railroad, and Drew took the presidency of the New Jersey Steam Navigation Company, which was the leading boat company of the sound and the successor of the original line. In 1844 there was another combination route opened via the Long Island Railroad from Brooklyn to Greenport, Long Island, whence steamers plied to Stonington & Providence, and also to Norwich to connect with the road via Worcester. This Long Island route, having the longest rail line and the shortest water line, had the advantage over all others in point of time required. In this respect, it had the same advantage over the Stonington route that the Stonington route had over the Providence route. This Long Island line was very popular, was much used for three years and carried the United States mail

to Boston, but it was discontinued in 1847 on the completion of the New York, New Haven & Hartford Railroad and the opening of the Fall River Line. The Long Island route was a Vanderbilt interest, and he also had control of the Norwich route. The new steamer "Atlantic," which made its first trip from Norwich to New York, August, 1846, was a vessel 320 ft. long, 1,400 tons, and was described in *Hunt's Merchants Magazine* of that year (v 15:323) as the property of the Norwich & Worcester Railroad & Steamboat Co.



Steamship Colon; Panama Railroad.

It was said to be the acme of perfection, the finest as well as the largest ever built in America.

The Fall River Line (the Bay State Steamboat Co.) commenced business in May, 1847, running in connection with the Old Colony Railroad, which had been opened a few months before giving a through line from Fall River to Boston. The early opening of the steamboat line to complete the service to New York was brought about in the now well known manner of having the steamboat company well represented on the board of the railroad company. At various times during this early period difficulties arose over the division of proceeds between the railroads and the contracting steamship companies. In 1860 the future was foreshadowed and the difficulty settled for the Norwich & Worcester Railroad Company through the company itself taking a large interest in the organization of the Norwich & New York Transportation Company.

In 1860 the Stonington Railroad was extended to Groton, which in that year became the terminus of the steamboat line to New York. The destruction of the terminals at Groton led to the return of the line to Stonington in 1865. In the disturbed period just after the Civil War, there were various rearrangements and reorganizations of lines on the sound, one of which, through the failure of the Merchants Navigation & Transportation Company, left the Stonington road without connections in January, 1867. The company then adopted the thoroughly modern expedient of organizing the Stonington Steamship Company, in which it held 85 per cent. of the stock.

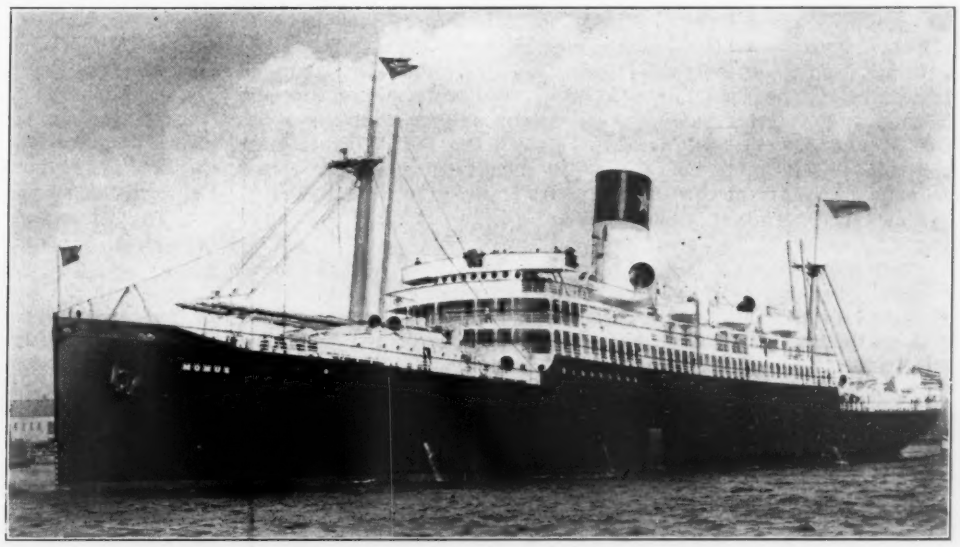
In the same year, 1867, a new route to Boston was opened by a contract arrangement between the steamers and the railroad connecting at Bristol. In 1868 this line and the Stonington line competed until rates went down to a dollar from Boston to New York, but they soon stopped that policy and worked harmoniously until in the hard times of 1877, the Stonington Company opened a new passenger steamship line to connect with Boston via Providence. This precipitated another rate war, during a part of which there were six different combination water and rail routes from New York to Boston, and two of them were operated by the Fall River Line, now in the control of the Old Colony Railroad Company. The rate war lasted until 1881 and was ended by an agreement to divide a part of the traffic among the contestants.

About 1885 the New York, New Haven & Hartford Railroad Company began to strengthen its grip on the steamer lines of the sound and in a decade it had gone a long way toward their absorption. In 1893 the New York, Providence & Boston Railroad was merged and with it went the Providence and Stonington Lines of steamers. Two weeks later a 99-year lease of the Old Colony Railroad followed and with it went the Fall River Line. In 1898 the New York & New England Railroad was absorbed, carrying with it the New York & New London Steamboat Line. In 1899 the New York & Hartford Steamboat Company opened a new line to Providence, calling it the Narragansett Bay Line, but the next year the New York, New Haven & Hartford Railroad got control of the company and withdrew the line.

The monopoly by the railroad steamship lines was, however, hard to maintain. The year after the last purchase just mentioned, the Joy Line, which had before been carrying only freight to Providence, began to carry passengers. The railroad met this by putting on a new steamboat line. The older regular lines were charging $3 to Providence, the Joy Line $1.75 and the new railroad boat line charged $1, and the Joy Line met this with $1.50 round trip.* At this time the rate on the old Fall River Line was still $3 and the traffic was falling. The competition went on until October, 1902, when the railroad with its many steamers and services could protect itself only by making an agreement with the Joy Line. Nor did even this guarantee it in peaceful monopoly, as "every year or so"† new competitors kept springing up. In 1906 this rivalry took the new form of trolley-steamboat competition in an active form at the hands of the Enterprise Navigation Company, which was selling through tickets at low rates in connection with trolley lines from Fall River to Boston.

The checkered experience of the steamboat lines on Long Island sound as they have gradually become more and more nearly railroad appendages is illustrative of the methods that have prevailed the world over, but it is scarcely worthy of the name of ocean transportation.

The Panama Railroad & Steamship Company is probably the first clear example of the oversea line in connection with an American railroad. This railroad, completed in 1855, was almost unique in having no local traffic and in being a connecting link between two sea ports which exist only because of through trade. To improve its traffic this road promptly established a steamship line from New York, and made contract arrangements with the then existing Pacific Steamship Companies plying north to Portland and south to Valparaiso. At times it has operated steamship lines of its own on both oceans, and its traffic contracts have been numerous.



Steamship Momus; Southern Pacific Company.

The year 1870 seems to mark the general beginning of formal

Railroad Gazette, 1900, p. 499 and 516.
†*Railroad Gazette*, 1906, p. 447.

connections between American railroad lines and transatlantic shipping companies. Before that time, coasting lines at various points had come under the control of the railroad companies to benefit the delivery of the railroad freight. This process has gone steadily forward until now many of the lines of coasting vessels in the United States are directly or indirectly controlled by the railroad companies, and most of those which are called independent must apparently have good working arrangements with railroad lines in order to keep out rivals.

About 1870 the eastern trunk line railroads, having their termini on the line from Buffalo to Pittsburgh, and down the Ohio to Cincinnati, began to extend their lines to the Mississippi and to Lake Shore points. To secure traffic from across the lakes they put lines of carriers upon the Great Lakes, and on those waters today the independent carriers are in a very small minority. This process began on the Great Lakes shortly after 1850,* when the roads having their termini at Buffalo reached out to the west for traffic by operating or arranging for steamer lines on the lakes. The new western connections won by the expanding eastern railroads gave an increase of through traffic which demanded satisfactory outlet across the Atlantic if the railroads were to prosper. This situation is well described in the words of the Pennsylvania Railroad Report for 1871 (see p. 25): "The main object of the organization of the Pennsylvania Railroad Company was to promote the traffic between this city (Philadelphia) and the west. * * * It was confidently expected on the completion of our railway, that the enterprise and the capital of the citizens of Philadelphia would have been at once enlisted in the marketing of the product brought to their doors, and the means furnished to transport them to the points of consumption. But it soon became evident that this could not be depended upon, and that our cars must pass to New York to meet purchasers of their contents, or the business of the company would be dwarfed to that of a second class railroad, a fact which the interests of the shareholders would not permit."

The situation thus described by the directors of the Pennsylvania was felt keenly by all eastern trunk lines, and they took steps to help themselves out of the predicament. The Pennsylvania organized a steamship company, which operated to Liverpool a line of steamers called the American Line, established in 1871. The majority of the stock of this company was held by the Pennsylvania, which also guaranteed the bonds of the shipping company. The organization of this corporation was similar to that of numerous subsidiary corporations organized by the officials of the Pennsylvania. The venture can scarcely be called a success because of the railroad's needs for more frequent and varied services than the commerce of Philadelphia supported. The reports of the railroad for the next few years very clearly showed this difficulty. As the next step to overcome it, the Pennsylvania secured the United Railroads of New Jersey (leased in May, 1871, for 999 years), giving a direct outlet to New York harbor with its many steamship connections.

In 1884 the railroad company's American Line ceased to run under that name and passed into the hands of the International Navigation Company. Both of these companies were presided over by a director of the Pennsylvania, and this relationship continued until after the formation of the International Mercantile Marine Company in 1902. Intelligent opinion in both England and America held strongly to the opinion that there was friendly and practical relationship between the Pennsylvania Railroad and the shipping company.† It should be remembered that the primary wants of the Pennsylvania Railroad were satisfied by its New York terminal, which accounts for the railroad company's lessened interest in the steamship enterprise.

The Baltimore & Ohio with its terminus at Baltimore, preceded by a year or two the entrance of the Pennsylvania into the shipping business by aiding in the establishment of the Atlantic Transport Line, which grew out of the Baltimore Storage & Lighterage Company, and gave the Baltimore & Ohio a European outlet. As was shown in the case of the Pennsylvania Railroad, ocean service from Philadelphia depended upon the steamship company acting in connection with the railroad itself. This was still more the case at Baltimore, and at such small places as Norfolk or Newport News, a railroad was helpless that did not depend upon some other seaport or furnish its own connections. At first the Norfolk & Western and Chesapeake & Ohio lines were dependent upon New York, through the aid of the Old Dominion and Clyde lines of coasting steamers. Then each of these railroad companies established a line of steamers to Europe. Later the Norfolk & Western gave up its line and lightered its goods across the estuary of the James to the terminals of the Chesapeake & Ohio, to export them by the Chesapeake & Ohio steamers. This steamship company, which is technically a British company with ships under the British flag, was controlled by the Chesapeake & Ohio until June, 1905, at which time the railroad withdrew its interest, but established an arrangement for continuing the service. This steamship line, from the mouth of the James and the Chesapeake, appears, in fact, to have gone through a number of arrangements. In 1900† the Southern Railway had been admitted to joint use of it and steamers were despatched to London, Liverpool, Hamburg and Rotterdam. At the same time two of the railroads, the Southern and the Norfolk & Western, had an arrangement with the United States Shipping Co. for the despatch of steamers direct to Dublin, Belfast, Glasgow, Antwerp and Amsterdam.

The ownership of the trans-Atlantic steamship line by the railroad company is not usual on the Atlantic coast, nor has it been from the first, the common method being a freight agreement between a railroad and a steamship owning company. The railroad company builds terminals, which it leases to the steamship company at nominal rates. In the period of the 70s and early 80s it was common for the railroad to guarantee the steamship company a certain amount of freight each month. This practice is not now so common, although the contracts cover periods of from five to ten years, and the railroad guarantees to deliver goods to the steamship line, and the steamship line to take the goods from the railroad and deliver import goods in return. The contracts are not mutually exclusive, but as the railroad controls the terminals, switching charges upon cars from other companies serve as a practical tax upon such shipment. It is easily possible, however, for goods to come by lighters from other railroads and go over the ship's side, although in the city of Boston even this is taxed by a so-called switching charge when the freight comes from the terminal of another railroad company.

This is quite different from the situation in New York, where nearly everything that is shipped is lightered, and each carrier deals with all others on terms of equality. There is also this further difference, that in New York the shipping line being independent of all railroads must provide its own terminal facilities, whereas in other ports they are usually provided by the railroad, which thereby guarantees its outlet. This is plainly evident at present in Philadelphia, where there are several lines operating to European ports in connection with the Reading and Pennsylvania railroads, and using their terminals. Boston has such lines, and from Portland, Maine, the Grand Trunk announced in 1903 that there would be four services to British ports, in connection with the Grand Trunk Railway during the ensuing winter, weekly to Liverpool and London; fortnightly to Bristol and Glasgow. These contracts were with three different steamship companies.

The ports upon the Gulf of Mexico usually having small population and little variety of freight are quite as dependent upon formal arrangements between railroads and steamship as are the smaller Atlantic ports. The Atlantic Coast Line, for example, has lines running from Miami to Key West and from Port Tampa to Havana. The vessels, under the flag of the Peninsular & Occidental Steamship Company, are controlled by the railroad company. The small port of Pensacola, served by the Louisville & Nashville, has a line of British steamers in which the railroad company is interested, running to Mexican ports. The company also has a contract with an Austrian steamship company to run a regular line of vessels between Pensacola and southern Europe. This regular service succeeded the occasional despatch of ships which had for eight years past been running between Pensacola, Genoa and Venice. The Louisville & Nashville has also contract arrangements with seven other lines of foreign steamers giving service from Pensacola to Liverpool, Hamburg, Bremen, Antwerp, Havre, Copenhagen, Rotterdam, China and Japan. The railroad took these steps to free itself from the irregular service of tramp vessels.

The Illinois Central Railroad, with its spacious New Orleans terminals, has similar arrangements with lines to some European ports, but in the larger ports of New Orleans and Galveston, the steamers in the foreign trade are more commonly independent than is the case in the smaller ports like Pensacola and Gulfport. The Southern Pacific has long run a line of steamers from New Orleans to New York, and in 1902 a direct line was established between Galveston and New York, thereby shortening the rail haul for western goods, but the New York-New Orleans service was still continued. Since the acquisition of the Cromwell Line, passengers as well as freight have been carried between these points by the railroad company's steamers, and three fast passenger steamers have been added to the service, one of which is illustrated herewith.

(To be continued.)

*Morrison's "History of American Steam Navigation," p. 573.
†See *Fairplay*, Nov. 3, 1904, p. 681, for a statement of British opinion.

The German Empire more than a year ago imposed what seemed to be a moderate tax on railroad tickets. The result of it has been a diversion of travel from the higher to the lower classes to such an extent that a decrease of about $2,500,000 in the passenger earnings of the Prussian State Railroads alone is attributed to it. Nearly at the same time a new schedule of charges for passengers and baggage was introduced, which on the same railroads reduced earnings about $1,500,000; but this was expected.

†See *Railroad Gazette*, Oct. 19, 1900, p. 694.

GENERAL NEWS SECTION

NOTES.

The Pennsylvania has issued rules forbidding profanity in its shops.

The roads in the Southeastern Passenger Association are to grant no further theatrical rates.

The Southern Pacific is increasing the number of stations which bill through to eastern points.

Railroad employees in Louisiana are preparing a great petition to the legislature not to pass a 2-cent-a-mile law.

The Western Transit Company, the lake line of the New York Central, is to open a traffic office in Spokane, Wash.

The Baltimore & Ohio put the nine-hour telegraphers' law in effect on February 17. The law becomes operative on March 4.

The Jim Crow railroad station built by the Midland Valley, in accordance with the constitution of Oklahoma, at Taft, Okla., was on February 14 burned by negroes.

The Interstate Commerce Commission, through United States attorneys, is to prosecute the Southern Pacific Company for alleged large rebating transactions in California.

The Boston & Maine has cut by 10 per cent. the salaries of all employees receiving more than $100 a month, with the provision that none of these shall be reduced below $100.

The Supreme Court of Kansas has declared the freight demurrage law of 1905 constitutional, imposing a penalty of $1 per car per day for delay in furnishing freight cars ordered.

A general wage conference has been called at St. Paul, March 9, at which contemplated wage reductions west of Chicago will be discussed by railroad officers and union delegates.

The Oklahoma State Corporation Commission has ordered that no passenger on a railroad shall be compelled to give up his ticket or pay his fare until a seat has been furnished him.

The Nebraska State Railroad Commission, on February 11, instructed the Attorney-General to prosecute all pass-holders not included in the list of exceptions to the anti-pass law.

The New York Court of Appeals has awarded damages in a case where "this side up" notice on a number of freight packages were ignored by the railroad, to the damage of the contents of packages.

The differential in favor of Galveston over New Orleans on packing house products carried to Havana has been reduced from 2 cents to 1 cent; in July, 1907, it had been reduced from 4 cents to 2 cents.

President Diaz has ordered that all American railroad employees in Mexico must learn to speak Spanish within six months in compliance with the petition of the Grand Lodge of Mexican Railroad Employees.

Both houses of the Virginia Legislature have passed the bill allowing parallels to the Richmond, Fredericksburg & Potomac to be built. This step was recently favored in a long letter by John Skelton Williams.

The New England Car Service Association has voted to dissolve, effective February 29. The railroads which constituted the association will handle the business and hope to save some $40,000 to $50,000 a year.

Two cylindrical cement kilns, 125 ft. long, each with an outside diameter of 9 ft. 5 in. at the widest point, are being shipped from the Vulcan Iron Works at Wilkesbarre, Pa., to Los Angeles. Each kiln is loaded upon three steel flat cars.

Judge Hanford, of United States District Court, on February 15, at Olympia, Wash., handed down a decision holding that the railroad commission at Washington has no authority to fix rates, this right being vested only in the state legislature.

The Wisconsin Railroad Commission has ruled that the railroads of that state are free to close telegraph stations on account of the nine-hour law. It holds that the stations closed thus far do not interfere with the safe operation of traffic.

On the Cincinnati, New Orleans & Texas Pacific and the Alabama Great Southern, employees whose pay is more than $100 a month are to have it cut 10 per cent.; employees receiving between $50 and $100 a month are to have their pay cut 5 per cent.

A press despatch says that the Georgia Railroad Commission will order the Southern Railway to pay $100 fine for five failures of the station agent of Hiram, Ga., to post late trains. If the railroad does not pay, the Governor will be asked to sue under the law, which places a fine of $200 for such offense.

Colonist rates to the west, to be in effect through March and April, will be $5 higher than formerly from both Chicago and Missouri river gateways. Although stop-overs are not allowed on regular first and second class tickets, they are on these cheap tickets.

The Kansas Railroad Commission ordered the railroads of the state to put a maximum freight tariff which makes a reduction of about 20 per cent. in the freight rates in effect on February 14. The roads have 30 days in which to determine whether they will contest the law.

The railroad commission of Texas on February 18 directed the Attorney-General to bring suit against the Missouri, Kansas & Texas, the Galveston, Harrisburg & San Antonio, and the Texas & New Orleans to recover heavy penalties for failure to run passenger trains on time.

The Railroad Commission of Indiana has given a decision that a railroad may grant lower rates to other railroads than to other shippers. It was shown that to prohibit these lower rates would destroy a market for about 750,000 tons a year of Indiana coal now sold to railroads.

The Union Pacific is to reduce its rates from Missouri river gateways to points in the Northwest to the reduced level in force on the Great Northern and the Northern Pacific as a result of reductions under the 2-cent fare law in Minnesota and 2½-cent fare law in North Dakota.

The Pennsylvania will hereafter use only one engine on passenger trains up the steep westbound grade near Altoona, Pa. The 18-hour Pennsylvania Special Limited will lose six minutes in consequence, but the time will be made up west of the Gallitzin tunnel near the top of the grade.

The Burlington and the Denver & Rio Grande have begun a new joint service for l.c.l. freight from Chicago to Colorado and Utah points. The time over the Burlington from Chicago to Denver is 68 hours, and over the Denver & Rio Grande from Denver to Salt Lake City 48 hours, a total of 116 hours from Chicago to Salt Lake City.

The Central Electric Traffic Association, which has been formed at Dayton, Ohio, is a branch of the Central Electric Railway Association which is made up of electric lines in Ohio, Indiana, Illinois, southern Michigan and northern Kentucky. The new organization is intending to do for electric lines what freight and passenger associations are doing for steam roads.

In spite of the 2-cent clause in the Oklahoma constitution, the Corporation Commission has issued an order exempting the Fort Smith & Western, the Oklahoma Central and the Wichita Falls and Northwestern railroads from the reduced rates. The Fort Smith & Western is to be allowed to charge 2½ cents and the other two roads will be allowed to charge 3 cents.

The Arkansas Supreme Court, on February 10, decided that the state could not compel through trains on the Iron Mountain to stop at Arkadelphia in compliance with a special act passed by the recent legislature. The court held that Arkadelphia was provided with ample facilities, and that to stop through trains there would be an interference with interstate traffic; hence the act was declared void.

The Interstate Commerce Commission, reporting to the Senate in answer to a resolution of Senator Tillman in an inquiry designed to throw light on availability of railroad bonds as securities under the proposed Aldrich currency act, reports that there is a constant tendency toward railroad combination; also that the express companies of the country hold $22,200,000 in railroad stocks and $12,300,000 in railroad bonds.

The Central Passenger Association has resolved not to make summer tourist rates lower than 2 cents a mile, subject to a concurrence of western roads. The Grand Trunk has reserved the right to make a lower rate. Among the difficulties of adhering to this minimum are the competition in certain localities between rail and water lines for summer traffic and the fact that rate fare legislation is threatened unless lower tourist rates are made.

Adversity has its uses. Since the slackening of freight traffic the Pennsylvania Railroad has been extending the use of absolute block signaling in the running of freight trains, and an officer of the road says that he hopes that the facility with which the regulations can be carried out and the satisfaction which the trainmen find in absolute blocking, will be so pronounced that the abandon-

ment of permissive blocking can be made permanent, even after business shall have picked up.

The Ward Line and eastern trunk lines have failed in their effort to make a change in the division of territory for Mexican traffic, and the dividing line remains much as it was; that is, through Buffalo and Pittsburg. The business east of this line to Mexico via New York has been given to the Ward Line, and the business west of this line via New Orleans to the Mexican-American Steamship Company. The eastern interests tried to have the line moved west so as to get more of the business.

At hearings held last week before the Public Service Commission of the first district representatives of the Interborough Rapid Transit opposed the proposed order requiring block signals on the local tracks of the subway. They said that the present capacity of the local tracks is from 33 to 36 trains on hour, and improvements were being made which would increase it to 51 trains; the block system and automatic stops would reduce the maximum to 36 trains an hour. Furthermore, that no passenger had ever been killed inside a car on the subway.

Railroad Legislation in Mississippi.

The Governor of Mississippi has sent a special message to the Legislature asking for a 2-cent-a-mile law, with the provision that the railroad commission may increase the rate if it is shown to be unprofitable. He suggests that the law be made effective several months hence. The message also calls for repeal of the fellow-servant law and of the statute relating to contributory negligence; asks the enactment of a law prohibiting railroad blacklists; demands a law prohibiting the drinking of intoxicants on running trains, and asks for new statutes for the regulation of telephone companies.

Representatives of the Southern Railway and the Mobile & Ohio have submitted to the Mississippi House Committee on Railroads a voluntary offer to establish a flat passenger rate of 2½ cents a mile on intrastate business and to issue interchangeable mileage books in 1,000 and 2,000 mile forms at the rate of 2 cents a mile. It is proposed to try the experiment for a year from April 1, with the option of abandonment by the railroad if unprofitable. The representative of the Southern Railway said that these rates embodied the basis of settlement in Georgia, Alabama, Tennessee and North Carolina, and he thought that Mississippi was entitled to obtain by peaceful means what the other states got by fighting. The offer was opposed by the representatives of a number of the other railroads in Mississippi, particularly the Illinois Central.

Appointment at Purdue.

Prof. C. F. Harding has been appointed head of the Electrical Engineering School of Purdue University, Lafayette, Ind.

The East River Tunnels.

The following report regarding the East River tunnels of the Pennsylvania Railroad was made at a recent meeting of the board of directors:

"At the present rate of progress, the four tunnels of the Pennsylvania Railroad Co. now being excavated under the East river from the Long Island and New York City sides will meet within the next three months. This will mean that one of the tunnels will be excavated and iron-lined this month; two additional tunnels will be excavated and iron-lined in March, and the excavation and the iron lining of the fourth tunnel will be completed in April or May. Work will then begin on caulking and lining of the tunnels with concrete 2 ft. thick."

Traveling on a Pass in France.

On the continent of Europe, where the state puts its finger into most pies, railroad traveling is invested with a number of formalities. One of these is in connection with the issue of free passes, on which, like most other things in that country, the French government levies a tax. The said tax is paid by the pass-holder affixing stamps to the value of four cents on the face of each single-journey voucher, and the railroad company does not profit thereby. Other formalities have, however, to be observed by the deadhead. In the first place, only receipt or other commercial stamps must be used. What penalty the unfortunate traveler furnished with a "permit of free circulation" renders himself liable to by the absent-minded employment of an ordinary everyday postage stamp is not definitely stated, but it is evidently a very serious matter. Having pasted the correct adhesives in the spaces provided therefor as the law directs, one must take the pass to the booking office of the station of departure in order that the stamps may be officially canceled. There the voucher must be turned over and signed on the other side. The holder is then free to travel by the train, provided that these operations are completed before its departure.

The Block System in Indiana.

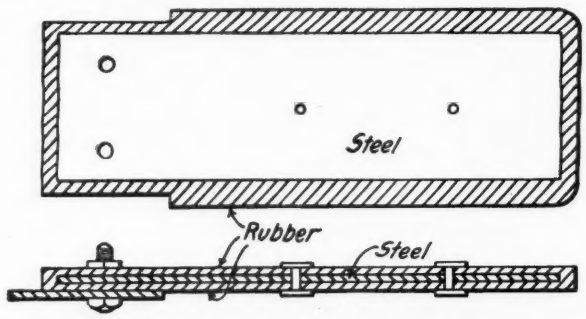
The State Railroad Commission of Indiana, which, acting under the recent law, has ordered the principal railroads of the state to have the block system in use by July 1, 1909, reports that progress is being made already. The number of miles of road now equipped with block signals is 1,891 and the number of miles yet to be equipped, under the order, is 3,423. Lines earning less than $7,500 per mile per year are not subject to the law. The Commission has relieved two roads from complying on account of their light traffic; the Elgin, Joliet & Eastern and the Chicago, Lake Shore & Eastern.

Allowed to Smoke in Shops.

The new General Manager of the International & Great Northern has caused to be posted in the shops and roundhouses at Taylor, Tex., a card giving the employees permission to smoke during working hours and while on duty. Heretofore this was absolutely denied the men. The supposition is that Manager Clarke was of the opinion that smokers would smoke regardless of orders, and that if not allowed to smoke in the shops they would find means to absent themselves.

Flexible Metallic Semaphore Blades.

The Pennsylvania and the Baltimore & Ohio have adopted as standard the flexible metallic semaphore blades for dwarf signals made by Blank & Russell, Wilkinsburg, Pa. The accompanying drawings show the construction of this blade. It consists of a steel rib of clock spring temper, thick enough to be sufficiently strong and

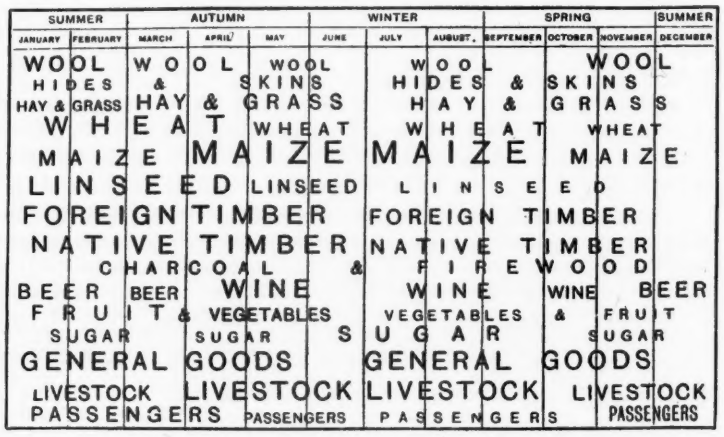


Sections of Flexible Semaphore Blade.

$2^{9}/_{16}$ in. wide x 8 in. long. It is treated in a copper solution to prevent rust and encased in rubber firmly vulcanized to it. It is claimed that this blade will not warp, so its whole face is always presented to the engineman. When struck by projections it bends and afterwards springs back to its original position without damage. Even if the rubber covering should be entirely torn off, the reinforcing rib would be left to give the signal indication. However, they have been tested in exposed places for three years without renewal. It is, of course, impossible for boys or malicious persons to cut or tear the blade from the casting.

Principal Articles of Traffic by Seasons, in Argentina.

The Buenos Ayres & Rosario Railway, which operates 2,361 mlies of line in the Argentine Republic, and had gross earnings of $22,822,325 (£4,564,465) for the year shown below, has published the accompanying diagram showing the principal commodities carried, by seasons. The size of the type is intended to indicate the proportion of each class of traffic carried during each period; the most important article is maize (corn).



Traffic Diagram; Buenos Ayres & Rosario.

A Blow to the Tipping System in Business.

A decision has been given by the Appellate Division of New York State, under which it was held that a merchant need not pay for or return goods bought by one of his employees who had accepted a tip from the manufacturer. In discussing the decision, the counsel for many of the largest department stores in New York, including the store which brought the action under which the decision was returned, said:

"The very few convictions obtained under the anti-tipping law proved that law to be impractical as a means of stamping out the nuisance. At the best, it was a small fine for the offender on conviction, and it was found that many were willing to risk this. Therefore, it was determined to refuse to pay for or return $1,555 worth of goods which had been bought by an employee who had received a bribe of $75 from the manufacturer. The grounds for this refusal were that the manufacturer in bribing the buyer was a party to a crime, and that being so, the law says that the parties to a crime cannot get any benefit from it. On appeal to the Appellate Division our view of the matter was held to be correct, and the result, I think, will be to stamp out the practice. It is probable that the value of the goods retained will be given to charity, as, of course, the store does not want to profit by the commission of crime."

Street Railway Fares.

At the same time that a bitter political campaign is raging around the Cleveland and Detroit street railway companies, to bring about universal 3-cent fares, the Lexington & Boston Street Railway Company (Boston Suburban Electric Companies) has demonstrated that it cannot make a living profit out of 5-cent fares, and has raised its rates to the old-fashioned horse-car basis of 6 cents. The Lexington & Boston was built in 1900; it operates 33 miles of track, competing sharply with the Boston & Maine, and has found that its receipts have remained practically stationery, while new financing has been necessary to provide for the upkeep of the property. It has paid no dividends since 1904.

Production of the United States Steel Corporation.

The following table shows the percentage of normal production which the United States Steel Corporation was producing on certain recent dates:

Dec. 31, 1907	28 per cent. of normal.
Jan. 15, 1908.	35 " " " "
Jan. 31, 1908.	40 " " " "
Feb. 1, 1908	46 " " " "
Feb. 18, 1908	49 " " " "

New York City Accidents in January.

The Public Service Commission gives out figures of the January railroad and street railway accidents in New York City, as follows:

Car collisions	170
Persons and vehicles struck by cars	934
Boarding	479
Alighting	416
Contact with electricity	34
Other accidents	1,888
Total	3,921

The following injuries to persons were recorded:

To passengers	1,444
To persons not passengers	570
To employees	486
Total	2,500

Another table gives these statistics:

Killed	44
Fractured skulls	15
Amputated limbs	6
Broken limbs	32
Other serious injuries	91
Total	188

The total number of accidents in December was 3,993 and total killed 51.

Canadian Grain Shipments by Lake.

Fort William and Port Arthur, Ont., during the 1907 season of navigation, shipped by vessel 26,559,685 bushels of wheat in Canadian vessels and 5,838,069 bushels in foreign vessels (all to Port Huron and Buffalo), a total of 32,397,755 bushels, as against 65,472,397 bushels in 1906.

An American Signal Superintendent in England.

Arthur H. Johnson has been appointed Chief Signal Superintendent of the London & South Western, England, succeeding J. R. Annett, retired. Mr. Johnson was born in England, but received his early railroad training in the United States. He was for a time, about 1894, Special Engineer of the Erie, and has been an occasional contributor to the *Railroad Gazette*. From the Erie he went to England, and after two years went to New Zealand, where he was Signal and Telegraph Engineer on the New Zealand Government Railways. For some years past he has been Telegraph Superintendent of the London & South Western. This road has adopted automatic signaling to a greater extent than any other English line. Mr. Johnson is a son of Henry Johnson, the well-known signal engineer, and brother of Sidney G. Johnson, of the Union Switch & Signal Co., Swissvale, Pa.

Atlantic, Pacific and Gulf Ports.

The commerce at the principal customs districts and ports of the United States, calendar years 1897 and 1907, in millions of dollars was as follows:

Ports and customs districts.	Imports. 1897.	Imports. 1907.	Exports. 1897.	Exports. 1907.
New York	466	830	405	683
Boston	86	123	104	105
New Orleans	14	44	100	165
Galveston	1	8	61	197
Philadelphia	44	81	52	107
Baltimore	11	36	99	99
San Francisco.	41	54	40	30
Puget Sound	8	25	15	44
Savannah	1	2	26	65
All other	71	220	198	428
Total	743	1,423	1,100	1,923
Atlantic ports.	616	1,107	772	1,155
Gulf ports	18	62	181	433
Mexican border	4	17	13	41
Pacific ports	51	91	64	94
Nor. brdr & lake	47	123	70	200
Interior ports.	7	23	..	..

Organizing a Friendly Union.

At the annual meeting of the Postal Telegraph Co. (Mackay Companies) President Clarence H. Mackay gave the following account of the change in labor organization which the company made last fall. The idea seems capable of extension.

In August, 1907, in several cities part of the employees of the Postal Telegraph Company "struck." They struck without warning, without grievance and without cause. They seem to have struck in sympathy with a strike by the employees of the Western Union Telegraph Company. They did not even formulate their demands until several weeks later. Thereupon the officials of the Postal company, all of whom came from the ranks, became telegraphers again, and with those operators who remained loyal and with clerks from other departments kept the business of the company and of the country going. The trustees do not hesitate to say that a more devoted and expert staff is not to be found anywhere in any line of business.

The strike lasted 12 weeks and then the company took back only the efficient and reliable men. The monetary loss to the company due to the strike only served to demonstrate the soundness of the plan on which the Mackay Companies is formed; namely, so wide a distribution of its interests as to minimize the effect of any loss from one particular source.

The Postal Telegraph Company realized, however, that the telegraphers' union was a menace. Telegraphy is a profession, and its messages are so confidential that to divulge them is a criminal offense. Telegraph employees cannot be allowed to give their allegiance to a union in preference to their duty to their business. Accordingly, the company in October, 1907, organized the Postal Telegraph Employees Association, to be open to all its employees who would abjure all unions, to be conducted without dues and without debts and to entitle its members to aid from the company during sickness or disability. This association was enthusiastically received and joined by the employees. It is now thoroughly established, and renders impossible another strike, and further, it strengthens the bond of loyalty and sympathy which always existed between the Postal Telegraph Company and its employees.

INTERSTATE COMMERCE COMMISSION RULINGS.

The Commission, in an opinion by Commissioner Harlan, has announced decision in the case of the Merchants' Traffic Association vs. Pacific Express Company. Complaint was made of a general special rate of $2 per 100 lbs. on milk and cream from St. Paul, Neb., to Denver, Colo., lawfully in force only because of inadvertent omission of defendant to file its mileage scale of milk and cream rates under which the lawful rate between these points would have been 58 cents. After this complaint was brought before the Commission, defendant filed on short notice a mileage tariff making the 58-cent rate. This being satisfactory to the parties, it was stipulated on the hearing that the complaint might be dismissed. The Commission in making the stipulation effective ordered the maintenance of the 58-cent rate for a period of not less than two years, but holds the case under further advisement.

Rulings About Passenger Service.

The Commission, on February 15, announced that the railroads in arranging personally conducted tours must keep separate the charges for transportation, meals and hotel accommodation, leaving to the passenger the right to accept the transportation with or without the other accommodations. A railroad is permitted to stimulate traffic by providing entertainment to which it may contribute, at a point on its lines, but such contributions must be made in a

definite sum and be in no way dependent on the number of tickets sold. A passenger traveling on a special limited excursion ticket with stopover privileges who misses connections because of successive delays of trains, is entitled to have his ticket made good if out of date when he makes the return trip. Passes granted to state railroad commissioners cannot be used in interstate journeys.

Reparation Granted Because of Reduced Rate.

In the case of Minneapolis Threshing Machine Co. vs. Chicago, Rock Island & Pacific (opinion by Chairman Knapp) it appeared that complainant shipped from Dallas, Tex., to Kansas City, Mo., seven carloads of agricultural machinery on which it was compelled to pay a rate of 72 cents per 100 lbs. At the same time the rate from Dallas to Hopkins, Minn., on these articles was 43¼ cents. The distance from Dallas to Kansas City is 625 miles, while the distance from Dallas to Hopkins is 1,240 miles, Kansas City being directly intermediate between Dallas and Hopkins. It appears that at the present time the shipments made as above stated would take a rate of 36 cents only.

The Commission decided in this case that the 72-cent rate was excessive and that the 36-cent rate which the defendant now voluntarily affords is reasonable. The defendant was ordered to pay complainant the sum of $641 as reparation.

Powers of the Commission do Not Include Authority Over Rights of Stockholders.

The Commission, in an opinion by Chairman Knapp, has announced decision in the case of John B. Manning vs. Chicago & Alton Railroad and Louisiana & Missouri River Railroad. The complainant alleged that he has for many years been the owner of shares of stock of the Louisiana & Missouri River, which has been merged in the Chicago & Alton Railroad, and that he cannot procure a statement of the earnings and expenses of the Missouri company, and asks the Commission to investigate the matter and require the Alton company to keep a separate set of accounts covering the operation of the Missouri company.

The Commission decided that the powers conferred on it were not intended to be exercised for the purpose of ascertaining whether an individual stockholder has been wronged by such transactions as those in question. The investigation which the complainant desires is not required by considerations of public interest or the proper discharge of official duties. The complaint was dismissed.

Demand for Station Facilities Compromised.

The Commission, in an opinion by Commissioner Clements, has announced decision in the case of John H. Lewis et al. vs. Chicago, Rock Island & Pacific. The complainants prayed for an order requiring the railroad to re-establish its station facilities at Fanshawe, Okla. It seems that defendant had established a station at Fanshawe in 1892, but had discontinued it in 1901. Complainants claim that this resulted in unjust discrimination. At the hearing, defendant agreed to build a spur track at Fanshawe for delivery of freight and to have stopped every day, on signal by flag, one passenger train in each direction. Complainant stated that this arrangement would be satisfactory, and defendant has complied with the understanding in respect to passenger facilities.

The Commission said that since it appears that the public interest, so far as involved, will be subserved by the fulfillment of this understanding, and in the expectation that this will be accomplished by the defendant at an early date, it will not review the fact or express an opinion on the merits of the controversy, but an order will be entered dismissing the case without prejudice.

MANUFACTURING AND BUSINESS.

Robert McF. Doble, Consulting and Supervising Engineer, making a specialty of hydro-electric power development and transmission, formerly of San Francisco, Cal., has moved from Colorado Springs, Colo., to 528 Majestic building, Denver.

At the annual meeting of the directors of the Frost Railway Supply Co., Detroit, Mich., on February 11, the following officers were elected: President, Harry W. Frost; Vice-President, George A. Cooper; Treasurer, Frederick H. Holt; Secretary, James Whittemore; Assistant Secretary, Harry C. Smith.

Among the recent orders taken by the Power Specialty Co., New York, for the Foster steam superheater are the following: Home Electric Light & Steam Heating Co., Tyrone, Pa., 840 h.p. in Heine boilers; Torresdale Filtration Plant, Philadelphia, Pa. (second order), 900 h.p. in Heine boilers; Western Clock Manufacturing Co., LaSalle, Ill. (second order), 300 h.p. in return tubular boilers; Bernheimer & Schwartz Brewing Co., New York, 1,900 h.p. in Heine boilers; Garden City Co., Garden City, L. I., 200 h.p. in return tubular boilers; National Sugar Refining Co., Yonkers, N. Y., 1,134 h.p. in B. & W. boilers. It has also sold independently fired Foster superheaters to the New Jersey Zinc Co.; the University of West Virginia; the Abendroth & Root Manufacturing Co., and the Seacoast Canning Co. The latter company has within the past year equipped seven of its plants with Foster superheaters, installing them in return tubular boilers.

Iron and Steel.

The New York, New Haven & Hartford is said to be in the market for 1,000 tons of material for a bridge at Providence, R. I.

The board of supervising engineers in charge of the rehabilitation of the Chicago street railways has, it is said, authorized the purchase of 8,000 tons of rails.

OBITUARY NOTICES.

Asa G. Dailey, formerly Superintendent of Tracks and Bridges of the Michigan Central, died at his home in Detroit February 5.

David P. Barhydt, who died at his home in New York City last week at the age of 92, was for many years President of the Erie & Kalamazoo, one of the first railroads west of Lake Erie; and he was one of the incorporators of the Sixth Avenue Street Railway in New York City, in 1851.

James D. Layng, Vice-President of the Cleveland, Cincinnati, Chicago & St. Louis, died at his home in New York City February 12, at the age of 74 years. Mr. Layng was formerly one of the most active railroad officers in the country and had held important positions for half a century. He had served on a number of different lines but will be most generally remembered as Superintendent and General Manager on the Pennsylvania Lines West of Pittsburgh between 1858 and 1881, and as Vice-President or General Manager of the West Shore Railroad from 1884 to 1899. Mr. Layng was born at Columbus, Pa., August 30, 1833, and was graduated from the Western University of Pennsylvania at the age of 16. He immediately entered railroad service, beginning as a rodman on the Ohio & Pennsylvania. He worked up through different engineering positions on this and other roads until 1856, when he was made Chief Engineer of Maintenance of Way of the Steubenville & Indiana. As the western lines which made up that part of the Pennsylvania system were gradually consolidated, Mr. Layng was promoted to different positions and in 1874 was made General Manager of the Pennsylvania Lines West of Pittsburgh and Erie (?). In 1881 he went to the Chicago & North-Western, but two years later went to the West Shore, then just finished, and he remained with the New York Central lines until his death. When the management of the West Shore was merged with that of the New York Central, Mr. Layng devoted his time chiefly to the "Big Four," of which he had been an officer since 1887, having been President of the Cleveland, Columbus, Cincinnati & Indianapolis before its consolidation with the present "Big Four."

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

Iron and Steel Institute.

The Secretary announces that the annual general meeting is to be held at the Institution of Civil Engineers, Great George street, London, S. W., May 14 and 15, 1908. The annual dinner will be held—under the Presidency of Sir Hugh Bell, Bart—in the Hotel Cecil, on May 14. The autumn meeting is to be held in Middlesbrough on September 29, and following days. The council will soon award Carnegie Research Scholarships, described in the *Railroad Gazette* of January 24, and candidates must apply before February 29. The awards will be announced at the general meeting. Bennett H. Brough, 28 Victoria street, London, S. W., is Secretary.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Canadian Pacific.—Charles Drinkwater, who has resigned as Secretary, will continue in the service of the company as Senior Assistant to the President, with office at Montreal.

Chicago Terminal Transfer.—William T. Nelson and H. H. Hall have been elected Directors, succeeding Fred G. Reighley and Ralph M. Shaw.

Mobile, Jackson & Kansas City.—George R. Sheldon, A. P. Walker and John W. Simpson, of New York; John McLeod, of Philadelphia, and Wallace B. Rogers, of Laurel, Miss., have been elected Directors, succeeding Charles E. Levy, R. W. Jones, Jr., former President of the suspended Oriental Bank of New York City, Edmund K. Stalle, J. W. Whiting and Richard B. Scandrett. Brayton Ives, President of the Metropolitan Trust Company of New York, is Chairman of the Board, and the other Directors are: L. S. Berg, President; W. D. Stratton, Vice-President, and Alexander McDonald.

Southern Pacific.—W. F. Ingram, heretofore in the service of lines controlled by the Southern Pacific in Mexico and Arizona, has been appointed Assistant Auditor, with office at San Francisco, Cal.

Operating Officers.

Erie.—G. W. Kirtley has been appointed Superintendent of Car Service. C. C. Riley, Superintendent of Transportation, has resigned and the office has been abolished.

Fort Smith & Western.—W. M. Bushnell, hitherto Assistant General Freight Agent of the Chicago & Alton, has been appointed General Manager of the Fort Smith & Western and the St. Louis, El Reno & Western, succeeding W. E. Crane, resigned; office at Fort Smith, Ark.

Illinois Central.—J. C. Dailey, Superintendent of the Chicago division, has resigned. See International & Great Northern.

International & Great Northern.—J. C. Dailey has been appointed General Superintendent, office at Palestine, Tex.

Mexican Central.—J. D. Melville has been appointed Superintendent at Cardenas, in place of A. C. Hobart, assigned to other duties.

Missouri Pacific.—E. F. Kearney has been appointed Superintendent of Transportation in place of T. E. Byrnes, resigned, office at St. Louis. John Cannon, who has been succeeded by M. M. Richey at Little Rock, has been appointed Superintendent of the Missouri division; office at De Soto, Mo., in place of J. W. Dean. Mr. Dean will take the place of Mr. Kearney as Terminal Superintendent at St. Louis.

New York Central & Hudson River.—C. I. McCoy, Passenger Trainmaster of the Hudson division, will also assume the duties of Trainmaster of the Putnam division in place of W. W. Currier, deceased.

New York, New Haven & Hartford.—J. D. Gallary has been appointed Trainmaster of the Providence division, and J. W. Carr, Trainmaster of the Western division.

St. Joseph Valley.—G. F. Moore, General Manager, with office at La Grange, Ind., has resigned and has been appointed an Inspector of Accounts for the Interstate Commerce Commission, with headquarters at Washington.

Southern.—D. W. Newell, hitherto Superintendent at Rock Hill, S. C., has been appointed Superintendent at Jacksonville, Fla., in place of J. A. Baumgardner, who has been made General Agent at Charleston, S. C. W. R. Hudson has been appointed Superintendent at Birmingham, Ala., in place of E. E. Stoup. W. J. Bell, hitherto Superintendent of the Macon division, has been appointed Trainmaster at Macon, that division having been consolidated with the Atlanta division.

Traffic Officers.

Missouri Pacific.—C. E. Styles, Assistant General Passenger Agent, with office at Kansas City, has resigned. Mr. Styles entered the service of the company 38 years ago at Atchison, Kan., and has served in many different positions in the passenger department.

Benton Quick has been appointed General Baggage Agent, in place of A. G. Brigham, office at St. Louis, Mo.

Engineering and Rolling Stock Officers.

Cincinnati, New Orleans & Texas Pacific.—J. P. McCuen, Superintendent of Motive Power of the lines in the "Queen & Crescent Route," has resigned, the resignation to take effect March 1. Mr. McCuen entered the service of the Queen & Crescent as Road Foreman on March 1, 1882; served as Division Master Mechanic at Chattanooga 1886-1887; was promoted to the position of Division Master Mechanic at Monroe, La., in 1887, and in 1892 was made Division Master Mechanic at Birmingham. On January 1, 1895, he was appointed Superintendent of Motive Power, with headquarters at Ludlow, Ky., which position he has held up to this time.

New York, New Haven & Hartford.—Appointments of Master Mechanics for each of the seven divisions of the company's lines, as reorganized, are announced as follows: New York division, J. M. Collins, office at Harlem river, N. Y.; Shore Line, P. C. Zang, office at New Haven, Conn.; Providence, G. A. Moriarity, Providence; Boston, J. Hocking, South Boston; Old Colony, D. R. Killinger, Taunton, Mass.; Midland, J. B. Gannon, East Hartford, Conn.; Western, H. C. Oviatt, New Haven, Conn. Messrs. Collins, Killinger and Gannon, heretofore at East Hartford, Roxbury and New London, respectively, are the only ones who have to go to new headquarters.

LOCOMOTIVE BUILDING.

The New York Central Lines have asked bids on 200 locomotives.

The Standard Oil Company is said to be in the market for 20 contractors' engines to be used on Staten Island, N. Y. This has not yet been confirmed.

CAR BUILDING.

The New York Central Lines are figuring on passenger coaches.

The New York, Ontario & Western has been figuring on new passenger equipment.

The Keeweenaw Central has ordered one smoking car, one baggage car and one express car from the Pullman Company.

The Idaho, Washington & Northern has ordered two passenger cars, one smoking car and one baggage car from the Pullman Company.

The Kiangsu & Chekiang has ordered two first and second class combination passenger cars, two straight second class cars and six third class passenger cars from the Pullman Company.

The Grand Trunk Pacific, as reported in the *Railroad Gazette* of February 7, 1908, has ordered 2,200 Grand Trunk standard box cars and 200 Hart convertible ballast cars from the Canada Car Company, and 500 standard box cars from Rhodes, Curry & Company. These are the cars to be received from these two companies during 1908 under a contract between the Grand Trunk Pacific and these companies covering a period of years.

The Panama Railroad is asking bids, up to February 24, on 300 thirty-ton box cars and 100 forty-ton Hart convertible cars. F. C. Nordsiek, 24 State street, New York, is Assistant Purchasing Agent. The box cars will be 40 ft. long and the Hart convertible cars 35 ft. long. Bodies and underframes will be of wood. The gage of track is 5 ft. The special equipment for all cars includes:

Bolsters	Body (box cars) Simplex; truck Simplex
Brakes	Westinghouse
Brake-beams	Simplex
Brake-shoes	Streeter steel back
Couplers	Box cars, Tower; convertible cars, Chicago
Doors (box cars)	Side, Security; Locks, Nat. Mall. Castg. Co.
Draft rigging	Minder tandem.
Journal boxes	McCord
Roofing (box cars)	Drake & Wiers Co.
Side bearings	Woods' or Miner.
Trucks	Arch bar

The Canadian Pacific, as reported in the *Railroad Gazette* of January 17, has ordered 400 steel Roger-Hart convertible ballast cars of 100,000 lbs. capacity from the Dominion Car & Foundry Co., to be built at the Blue Bonnets works. These cars will be 36 ft. 10 in. long between end sills, 8 ft. 7¼ in. high over all, and 10 ft. wide over all; 35 ft. 3 in. long inside as a gondola car, 4 ft. 4¾ in. high from rail to top of floor, and 8 ft. 8 in. wide, inside measurements. The tops and underframe will be steel. The special equipment includes:

Bolster, body	Steel built in the car frame
Bolsters, truck	Simplex
Brake-beams	Simplex
Brakes	Westinghouse
Couplers	Tower
Dust guards	Harrison
Journal bearings	Canadian Bronze Co.
Journal boxes	McCord
Paint	Metalistic
Side bearings	Susemihl
Springs	Canadian Pacific standard
Trucks	Barber rolled, with channel cross tie and with brake-beams hung to steel columns.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

BURRARD-WESTMINSTER BOUNDARY RAILWAY & NAVIGATION.—Organized to build lines as follows:

Vancouver, B. C., to Fraser river bridge, New Westminster; thence via Port Moody to the proposed Vancouver, Westminster & Yukon Railway bridge at Second Narrows, Burrard Inlet and thence to the place of commencement in Vancouver.

From the proposed Vancouver, Westminster & Yukon bridge to north arm of Burrard Inlet and to Howe Sound.

From Fraser river bridge at New Westminster to the international boundary line between Semiameo Bay and Sumas.

From False Creek, Vancouver, to Point Grey; thence to the Fraser river bridge, New Westminster.

From Port Moody to Stave river and the east boundary of Mission Municipality. Tupper & Griffin, Vancouver, B. C., Solicitors.

Chesterfield & Lancaster.—This company, which has just finished its road from Ruby, S. C., via Mount Croghan, Guess and Pageland to Crobuŕk, 21 miles, has projected an extension from that point north to Monroe or Charlotte, N. C., 20 to 40 miles.

Fairchild & Northeastern.—This company, which last year added five miles of line to its road, expects to finish its extension to Owen by June. It will then have a line from Fairchild, Wis., via Greenwood to Owen, 38 miles. Work is now under way on a change of track near Owen, which is to be finished this summer.

Northern Electric.—This company has finished work on its extension from Chico, Cal., west to Hamilton, 18 miles, with the exception of the drawbridge over the Sacramento river. The line is now in operation over a temporary bridge. During this year the company will probably build an extension from Marysville, Cal., to Colusa..

Northern Dakota.—Grading is to be started in April or May of this year on this proposed line from Edinburg, N. Dak., west to a terminal not yet named, about 21 miles. It is expected to have the line finished by August. Contracts will shortly be let for 60,000 ties. Thomas D. Campbell, President; E. Thorwaldson, Vice-President, and D. F. Bull, Secretary and Treasurer, Edinburg.

Oregon Electric.—This company has work finished on its line from Portland, Ore., via Tualitin and Wilsonville to Salem, 50 miles, with the exception of some ballasting now under way. An extension is projected from Portland to Forest Grove, 25 miles, for which surveys have been made. Guy W. Talbert, Manager, Portland.

Panhandle Short Line.—This company has projected a line from Dalhart, Tex., south via Hereford and Midland to San Antonio, with a branch from Midland to Deepwater at Rockport on the Gulf. Grading contract let to Miller & Jefferson for work from Dimmitt south to Lamb county, 60 miles. Grading finished from Hereford to Dimmitt, 32 miles. There will be a number of bridges. Additional contracts are shortly to be let. W. G. Ross, President, and A. D. Goodenough, General Manager, Hereford, Tex.

Perkiomen Traction.—Rights of way are being secured by this company for an electric line through Perkiomen Valley, Pa., about 11½ miles. I. H. Bardman, Schwenkville; H. T. Hunsicker, Ironbridge, and J. H. Dager, Norristown, are interested.

Pittsburgh, Canonsburg & Washington (Electric).—Grading started in November, 1907, from Washington, Pa., via Canonsburg, Thompsonville, Castle Shannon and West Liberty to Pittsburgh, 31 miles. Contract from East Canonsburg to Van Eman, two miles, let to W. H. Murdoch, Pittsburgh; from Thompsonville to Clifton, 1½ miles, to W. J. Payne & Sons Co., Pittsburgh, and from Clifton to Castle Shannon, two miles, to Samuel Gamble, Carnegie, Pa. There are to be bridges at East Canonsburg, Van Eman, Thompsonville and Clifton. F. Uhlenhaut, President, Pittsburgh. The line is being built by the Pittsburgh Railways Company.

Public Belt Railroad.—Contract has been let to the Orleans Engineering Co., of New Orleans, for building part of this double-track line around New Orleans, La. The proposed route is from the upper Parish line along the river front to Kentucky street, around the rear of the city to upper Parish line, thence along the protection levee to the point of commencement, 22 miles. Single-track has been laid from Parish line to Montegut street, 10 miles. W. J. Hardee, City Engineer, is Chief Engineer, and Hampton Reynolds, Assistant Engineer in charge. Work is also under way on storage tracks and bridges at various points.

Sacramento Valley & Eastern.—Grading has been finished on this line from Pitt near Kennett, Cal., via Pitt River and Copper City to Del Mar, 14 miles. It is expected to have the entire line finished by March 1. T. J. Deerborn, Chief Engineer, Kennett.

St. Joseph, Savannah & Northern.—This company has located its line from St. Joseph, Mo., north to Savannah, 15 miles. Construction work is expected to be begun this spring. T. B. Campbell, M. Tootle and F. J. Wheeler, of St. Joseph, are interested.

San Diego & Arizona.—An officer writes that this company has not yet finished its location surveys for its proposed line from San Diego, Cal., east to Yuma, Ariz., 200 miles. A small amount of grading has been done between San Diego and National City; also some in the mountains. Over $1,000,000 has been spent in securing rights-of-way and terminals in San Diego and National City. The company has taken over the franchises and property of the San Diego Eastern, projected over the same route. John D. Spreckels, San Francisco, is the principal promoter, and W. Clagton is Vice-President.

San Diego-Eastern.—See San Diego & Arizona.

RAILROAD CORPORATION NEWS.

Chicago, Cincinnati & Louisville.—The United States Circuit Court at Cincinnati, Ohio, on February 14 appointed James P. Goodrich, Chairman of the Republican State Central Committee of Indiana, receiver of this company, on application of George A. Fernald & Co., bankers, of Boston. This action is reported to be a friendly one. The application for a receiver was due both to inability to raise money and to the fact that gross earnings have fallen from $116,000 in October, 1907, to $64,000 in January, 1908. There is said to be a floating debt of $1,750,000. The road was formerly part of the "Great Central Route," but was separated from the Cincinnati, Hamilton & Dayton and the Pere Marquette after their receiverships.

Hudson & Manhattan.—Harvey Fisk & Sons, of New York, have recently offered $5,000,000 of an issue of $15,000,000 two-year 6 per cent. convertible collateral notes of the Hudson Companies at 98½, yielding over 6½ per cent. These notes are secured by first mortgage 4½ per cent. convertible bonds of 1957 of the Hudson & Manhattan Railroad at the rate of $1,500 of these bonds for each $1,000 in notes outstanding. These bonds are convertible after 1912 at par into common stock at $110 a share. The notes are convertible at maturity into these bonds at par. An article describing the present status of the Hudson & Manhattan Railroad, one of whose lines under the Hudson river is to be opened to traffic next Tuesday, will be found in another column. The Hudson Companies is the company formed to build and equip the Hudson & Manhattan Railroad. It has a paid up capital of $21,000,000 and owns over $5,000,000 worth of New York City real estate, largely at Sixth avenue and Thirty-second and Thirty-third streets, where the uptown underground terminal will be built.

Hudson Companies.—See Hudson & Manhattan.

Illinois Central.—There is a plan favored by the Harriman party to issue $30,000,000 equipment bonds on $40,000,000 worth of unmortgaged equipment to be used as collateral pending arrangements for permanent financing.

Kansas City, Mexico & Orient.—President Stilwell has sent a letter to stockholders asking that while the officers of the company are again undertaking the sale of bonds and stock in Europe, the stockholders subscribe either to one-year 6½ per cent. joint notes of the two construction companies which are building the railroad, each $1,000 note being secured by $2,000 in first mortgage bonds of the railroad company; or to first mortgage bonds of the railroad company, with a bonus of 40 per cent. in preferred and 40 per cent. in common stock; either of these subscriptions to be made at par. The funds thus obtained are to be used in pushing construction as fast as possible. Mr. Stilwell concludes as follows:

> "I cannot urge on you too strongly the necessity of completing the 67 miles of track necessary to connect the road between the Red river and Benjamin. This will give us a line in operation from Wichita, Kan., to Sweetwater, Tex., and will enable us to secure a great deal of through business. We have experienced very trying times and it has been difficult to carry on construction work during the past 90 days, but we have continued to do so, and I hope our stockholders will now come to our assistance and enable us to build this 67 miles so necessary to the success of the enterprise. This will give us 434 miles of continuous track in this one section which ought to show earnings of $20,000,000, or much more than we have invested in the entire line up to the present time."

National of Mexico.—The directors at a meeting held in the City of Mexico on February 14 decided to postpone action on the dividend on the first preferred stock, although it was announced that it had been fully earned. In 1907, 2 per cent. was paid. The first payment, 1 per cent., was in August, 1906.

New Orleans, Mobile & Chicago.—President Berg of the Mobile, Jackson & Kansas City, says that his company has obtained about $1,500,000 under the plan of reorganization with which to pay off floating debt, improve the property and provide new equipment. (Jan. 10, p. 74.)

New York, New Haven & Hartford.—Total operating revenue for the six months ended December 31, 1907, was $29,500,000. Operating income (after taxes) was $7,450,000. There was a deficit after fixed charges and dividend payments of $153,000.

Texas & Pacific.—The annual interest payment to be made March 1 on the $24,661,770 second consolidated income bonds has been reduced from 5 to 3½ per cent. From 1901 to 1907 inclusive, 5 per cent. was paid. In 1901 4 per cent. was paid, and in 1900 1½ per cent.

Toledo & Chicago Interurban.—James D. Mortimer has been appointed receiver of the Toledo & Chicago Interurban Railway, which operates about 40 miles of road from Fort Wayne, Ind., to Waterloo.